THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1489.] LONDON, NOVEMBER 24, 1891. [43RD YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR **GASHOLDERS, &c., &c.**
The Original "Torbay Paints" As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON,
And 23, Gt. George St., Westminster, S.W.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 930.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

SELF-CONTAINED DUST-FUEL FURNACE.
MELDRUM'S PATENT.

Extract from the *Smethwick Telephone*, June 13, 1891.

GAS COMMITTEE.

"The Manager [B. W. Smith, Esq.] reported that the adoption of MELDRUM'S PATENT FURNACES, he estimated, had resulted in a saving of 150 tons of Slack during the nine months they had been at work in the Boiler-House, and 360 tons of Slack during four months in the Retort-House; the fuel used in place of slack being the fine coke dust which formerly had to be carted or boated away at considerable expense."

MELDRUM BROS., Engineers,
ATLANTIC WORKS, 13, CITY ROAD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

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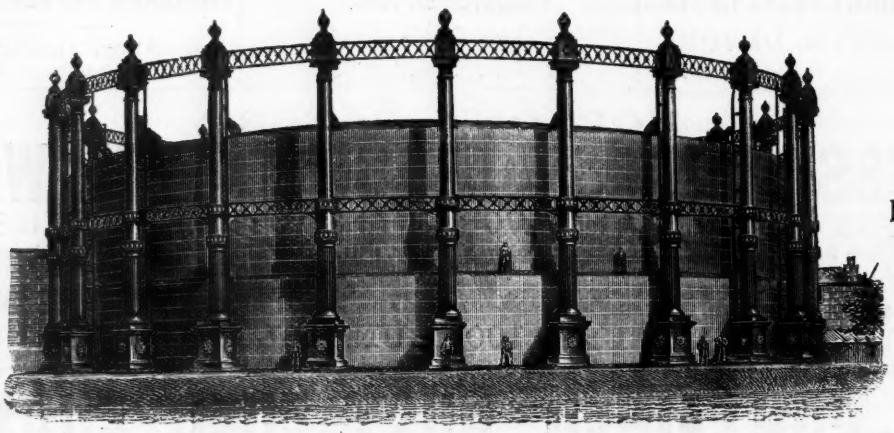
EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.



Manufacturers of PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.

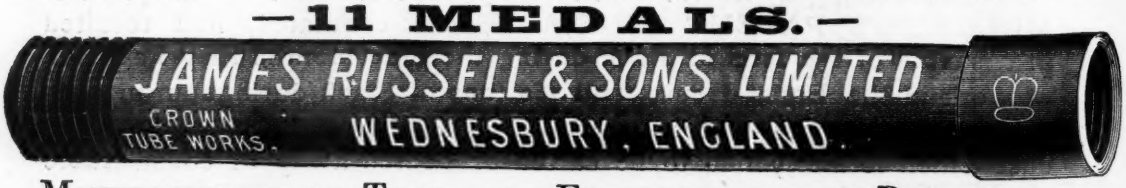
SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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LEEDS: 6, Mark Lane, New Briggate.

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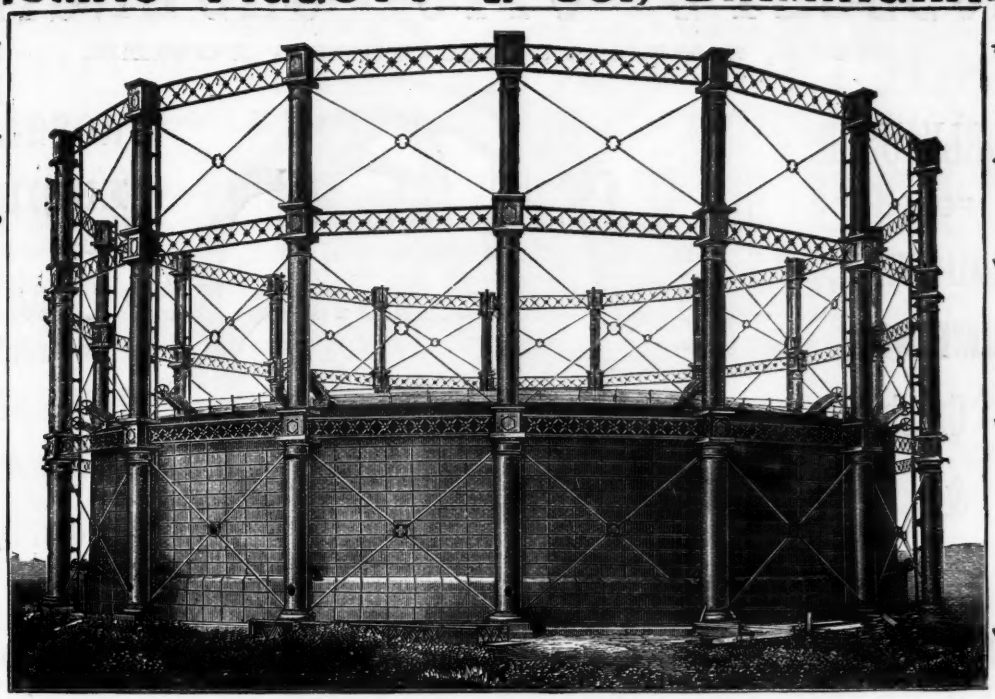
LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES. FOUL MAINS, RETORT-LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

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BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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BEST

REAL OLD SILKSTONE GAS COAL,

Address, THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION, OR Internal or External SCREWS, of all Sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

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Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

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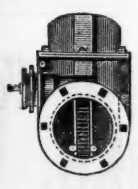
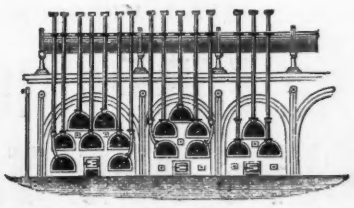
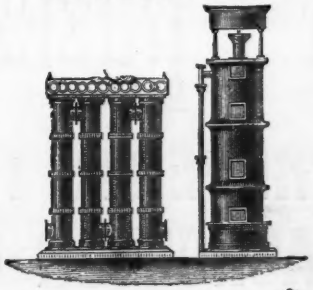
PATENT CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.







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HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

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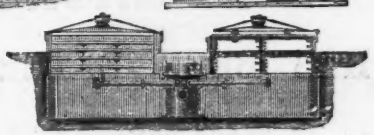


DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

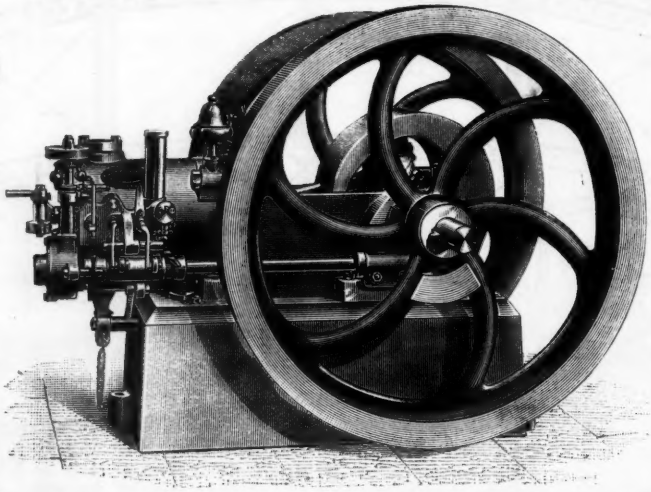
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

SIZES, 2-MAN TO 200-HORSE POWER.

LARGELY USED FOR **EXHAUSTING, PUMPING,** Coke Crushing, &c.



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MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

AVOID ACCIDENTS TO GASHOLDERS THROUGH FROST

BY ADOPTING

CUTLER'S PATENT FREEZING PREVENTER

WHICH PREVENTS THE FORMATION OF ICE IN GASHOLDER CUPS AND TANKS.

HAS BEEN EXTENSIVELY AND SUCCESSFULLY ADOPTED.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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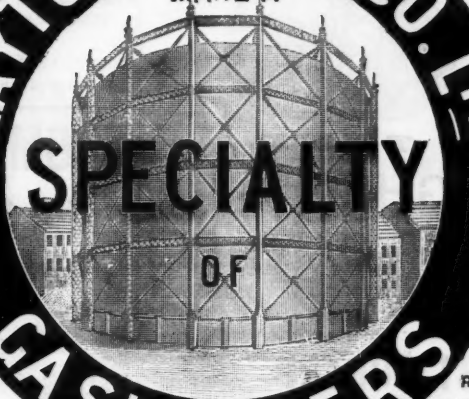

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"GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

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Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

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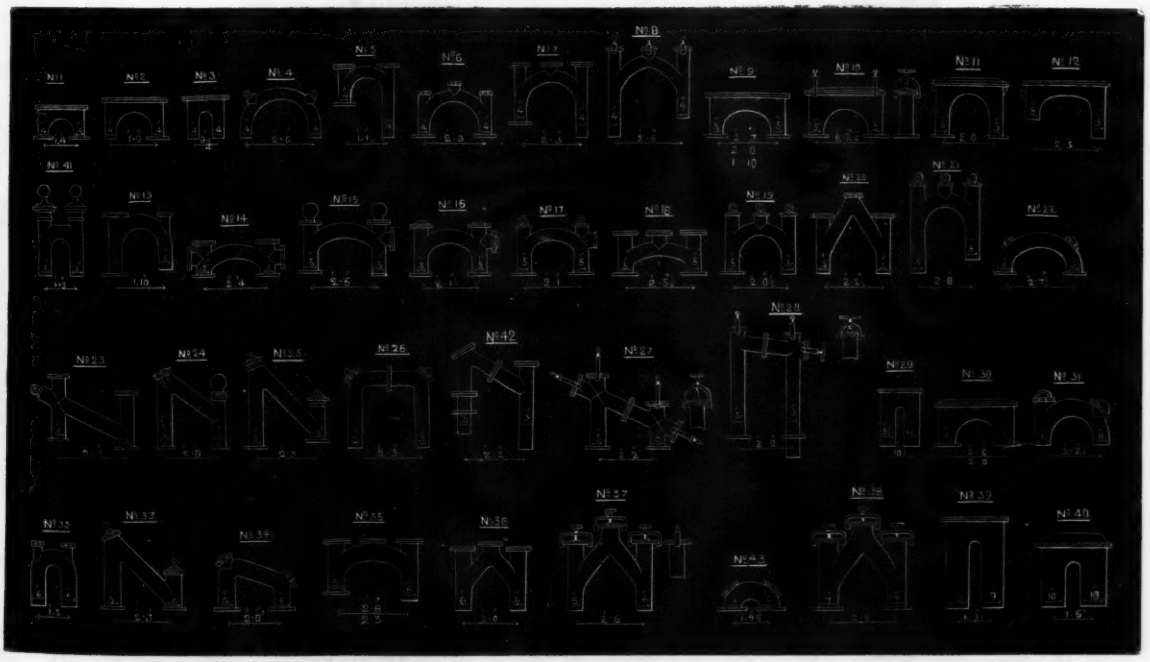

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Any of the above patterns can be made with either flange or spigot ends and with faced flanges or turned and bored plugs if required.
Designs Nos. 26, 27, 28, and 42 can be altered to any desired span without extra charge. Other variations by arrangement.

Patterns for special designs or spans made to order.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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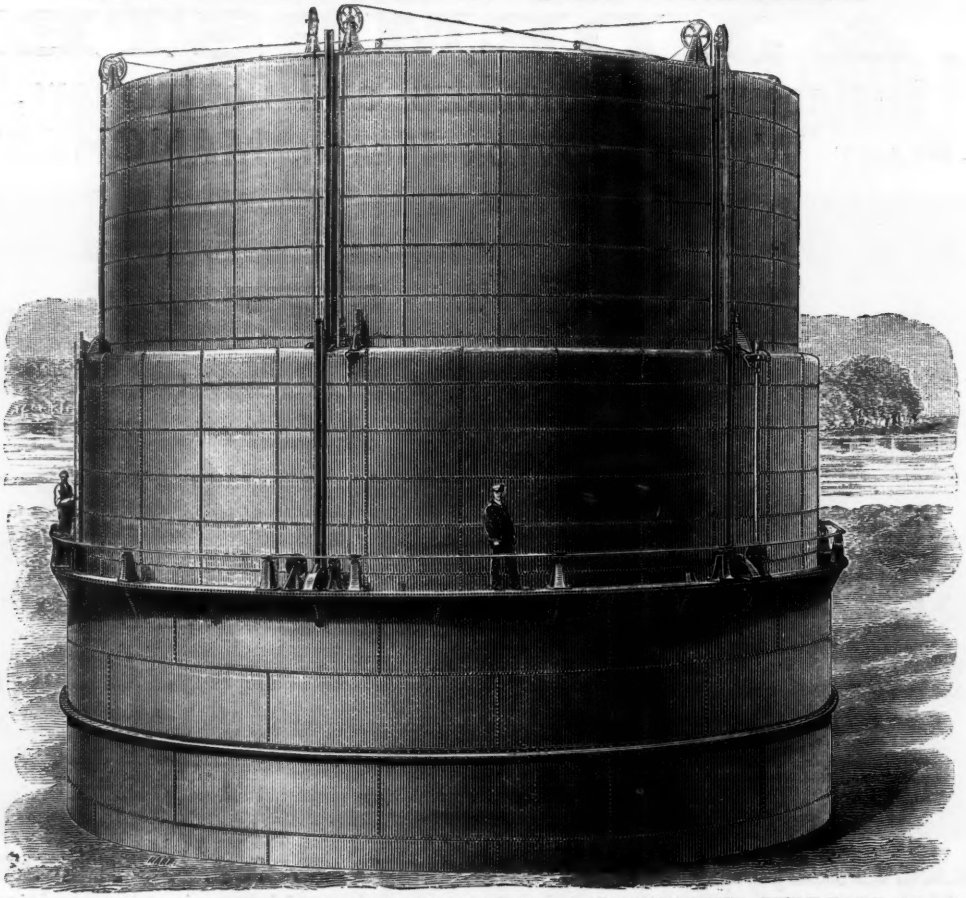

TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

430

of these Machines have now been supplied, and several are now in course of erection. These facts are given as evidence of the apparatus being the most efficient of any in the Market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

50 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to **25** original pattern Machines.

Estimates furnished for Cost of altering original pattern Patent "STANDARD" WASHER-SCRUBBERS, or for the supply of New Machines, on application at the Company's Offices,

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GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of
CAST-IRON PIPES, ALL SIZES,
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PUMPING ENGINES FOR WATER-WORKS.
BEALE'S GAS EXHAUSTERS,
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SLUICE VALVES,
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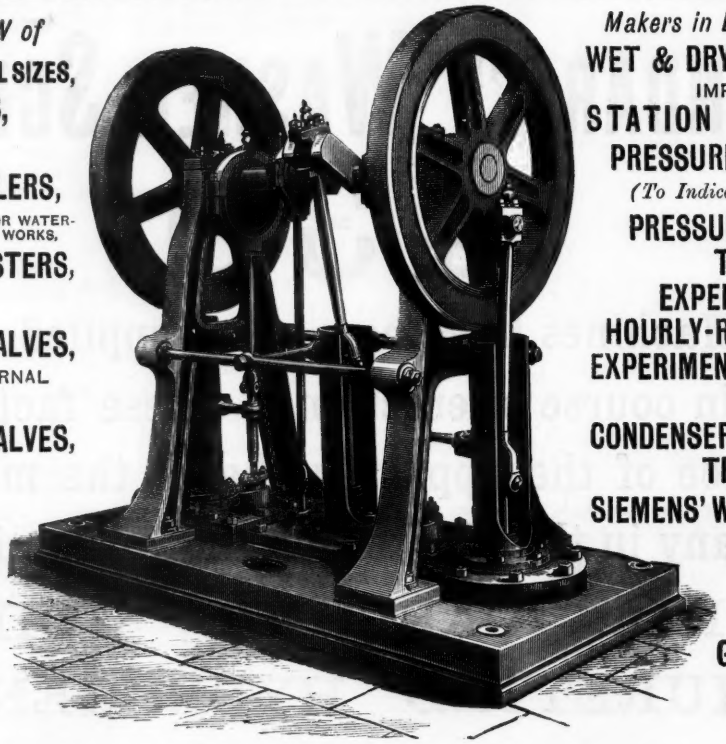
RACK OR SCREW
SLIDE VALVES,
CAST-IRON
COLUMNS,
BEAMS, GIRDERS,
AND
WATER-TANKS,
WROUGHT-IRON
TUBES,
FITTINGS, &c.



Makers in EDINBURGH of
WET & DRY GAS-METERS,
IMPROVED
STATION GOVERNORS,
PRESSURE REGISTERS
(To Indicate Now Time),
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HOURLY-RATE METERS,
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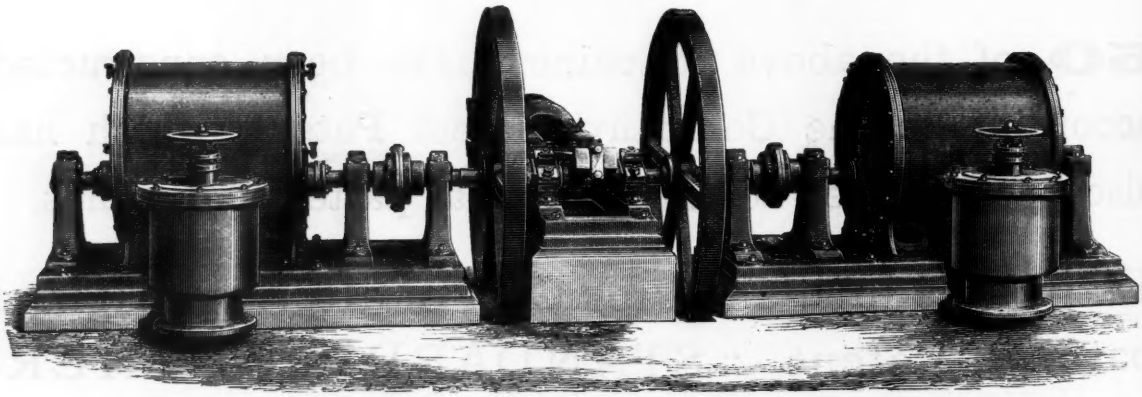
CONDENSER
THERMOMETERS,
SIEMENS' WATER-METERS,
STREET
LANTERNS,
And all Kinds of
GAS APPARATUS
AND
FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

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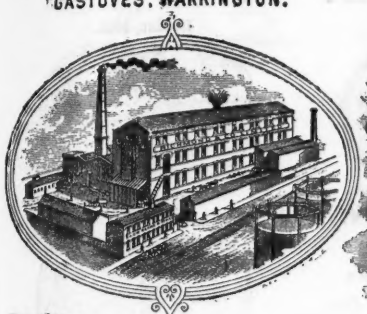

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Richmond & Co. Limited
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Heating Stoves
WATER HEATERS
BOILING BURNERS
GAS ENGINEERS
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Opened Temporary Offices and Show-Rooms in London

ON MONDAY, NOVEMBER 9, 1891,
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Mr. J. F. SIMMANCE (for 17 years with Messrs. W. Sugg & Co., Limited) will become, on Dec. 1, the Branch Manager, with

Mr. H. HALLETT (for 5 years with Messrs. T. Fletcher & Co., Cheapside and Warrington) as Assistant Representative.

The "VICTOR."

IN THESE STOVES WE COMBINE—

1. Chaste and Elegant Design, which, in Best Victoria Bronze, is without its equal, 55s. and 65s. extra.
2. The most perfect Waste-Heat Arrangement yet invented. (E.W.T. Richmond's patent). 4s. 6d. extra.
3. A combined Water-Pan and Fender, from which Vapour is delivered along with pure heated Air into the Apartment.
4. Magnificent Fret or Fuel Fire at same price.

The "SUPERB."

	Without Stand. High. In.	Wide. In.	Deep. In.	Stove Enamel Gold Relieved.	Best Victoria Bronze.
470 Fret 1470 Ball	28	19½	7½	£2 5s.	£5.
472 Fret 1472 Ball	29½	21½	9	£2 15s.	£6.
480 Fret 1480 Ball	28	23	9	£2 15s.	£5 10s.
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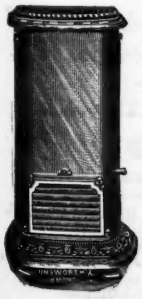
Stand and Water Pan, extra 8s. 6d.

Sizes, 470, 1470, 480, 1480 — 22 in. x 12 in. x 2 in. high.

472, 1472, 482, 1482 — 24 in. x 13 in. x 2 in. high.



No. **550.**

Made of Blue Coated Steel, with a surface equal to Plate Glass.

Requires no Black Varnish, and can easily be kept Clean with a Dry Duster.

SIZE: 30in. high, 18in. wide over all.

Price, **22s.**

Suitable for Rooms 14ft. square.

NEW LIST NOW READY.

No. **560.**

This is a handsome Stove, with Bright Copper Reflector, and body of Bright Blue Coated Steel, fitted with Hot-Air Tubes, suitable for Entrance-Halls, or Rooms up to about 18ft. square, and burns with a white flame.

SIZE: 21½in. wide x 16in. deep x 34in. high.

Price, **£2.**

With Cathedral Glass Front, Price, **£2 15s.**

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The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

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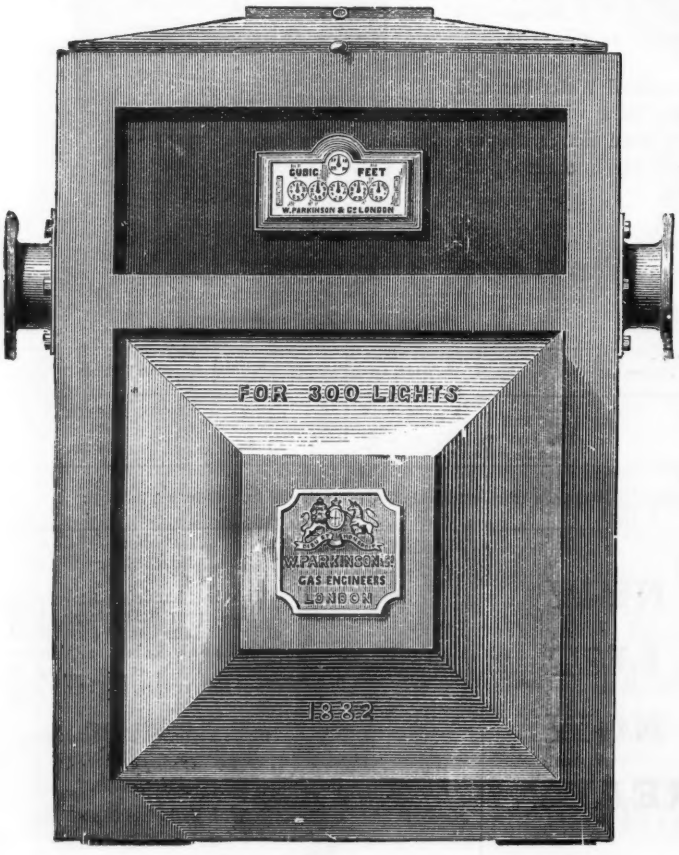

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 24, 1891.

Arbitration upon Labour Questions.

A NOTABLE incident of the past week was the publication of the award of the President of the Royal Institute of British Architects on the matters in dispute between the Central Association of Master Builders of London and the carpenters and joiners of London, which were remitted to him to settle when the prolonged strike which paralyzed building operations in the Metropolitan area during nearly the whole of last summer was terminated by an armistice. The circumstances of this affair were exceptional; and the matters in question were not of a kind in which we are particularly concerned. All employers and employed, however, whatever the nature of their occupation, must be interested in every example of the establishment of a rational method of settling labour difficulties. We consequently took particular note of the East Coast engineers' proceedings, when the common sense of the majority of the men overruled the efforts of Union officials to protract a factitious misunderstanding, from which only themselves could gain the slightest advantage. Similarly, now that the result of the arbitration in respect of the dispute in the building trade has transpired, we are interested in watching the effect of this method of obtaining a *modus vivendi* between the employers and employed. The first point to be noted is that the award has been received with a yell of disapproval by the noisy partizans of the "strike policy," who, in the building trade as in all other organized industries, take particular pains to gain the ears of the reporters for cheap newspapers, in order that their opinions shall receive priority of publication. Of course, when it is known that a strike arbitrator has made his award, the "smart" newspapers send their reporters round to ascertain "what the men think of it." The reporters naturally draw the most familiar coverts —namely, the back parlours of the public-houses wherein Union leaders are commonly to be found; and it is the scarcely disinterested views of these gentry that first come under the attention of newspaper readers. In the case in point, the report has been put about quite gleefully, by some organs of opinion which profess to have the workman's interest at heart, that the men are profoundly dissatisfied with the result of the arbitration, and will not agree to it. If those who make a good living out of the cultivation of the "strike policy" can get at them, the men will certainly be persuaded out of accepting the arbitrator's award; and the friends of peace will receive another disappointment. In this matter, it is only fair to acknowledge that the *Pall Mall Gazette*, which has hitherto been too prone to accept for gospel all that professional strike organizers chose to say, has taken the right course of warning the men that, unless they mean to sever themselves from all public sympathy, they must not reject an arbitrator's award because it does not give them all they ask for. It is stated, moreover, that the employers are not altogether pleased with the award; and this supposition that the arbitrator has satisfied neither side is taken by some careless observers as proof positive that he has done his business ill. It should rather be regarded as good *primâ facie* evidence to the contrary. Men of business who have experience of arbitrations recognize them as a means for acceptably "splitting a difference." When a man is determined not to abate one jot or tittle of his claim, as the price of obtaining a settlement, he does not submit the matter to arbitration, but fights his case to the end. Few causes bear out such an uncompromising attitude, however; and the average man of business, whether his difficulty is in respect of the price of a commodity, the execution of a contract, or the engagement of workmen, is solicitous mainly for any reasonable settlement which will permit him to go on with his affairs. Unless workmen, when they take their claims against their employers into an Arbitration Court, are prepared to abide by the issue, it is waste of time to go into the matter in this way. Let us hope that, in this case also, the good sense of the majority will prevail over the selfish counsels of those who have nothing to lose by a strike or a lock-out, and that the carpenters and joiners will show themselves to be quite as good men of business as their employers.

A curious consequence of the loss of the summer's work by the carpenters and joiners of London is incidentally referred to by Mr. J. Macvicar Anderson, the Arbitrator between masters and men, and has a by no means distant connection with the fortunes of the gas industry. He says that "the recent strike has been the means of inflicting "injury on the trade of the carpenters and joiners of "London from which, in his judgment, it will not recover; "for a large amount of carpenters' work has been superseded by other methods of construction, which are likely "to be increasingly adopted in future." Mr. Anderson was evidently here referring to the impetus that has been given to the concrete construction of floors, roofs, partitions, &c., by the difficulty of getting timber work done in London and the neighbourhood. This is really a serious point for architects to consider, because the very slight difference in cost between concrete and iron flooring, and woodwork, disappears when account is taken of the circumstance that difficulties with carpenters may render the latter method of construction impossible. It is a potent fact in regard to town buildings, that, by the intelligent

use of concrete, carpenters' work may be reduced to a minimum; while ironwork and foreign machine joinery go far to make the recalcitrant British joiner a superfluous luxury. It is with the growing popularity of concrete for house building that we are most concerned, however, for the simple reason that the best concrete for such a purpose, because the lightest, is made with gas-works breeze and cement. All the light grit produced in gas-works—clinkers, breeze, and pan ashes—makes good concrete; and many a building in London which must otherwise have stood still during the good pleasure of the carpenters last summer, was pushed on to its successful completion by the help of this class of material. Nobody wishes to throw the carpenters or any other class of operatives out of work; but when they sulk and make themselves "scarce," they must not complain if means are adopted for carrying on business independently of their assistance.

Turning Off Gas at the Meter.

When the average Coroner's jury confine themselves to their immediate duty of ascertaining the probable cause of a death or a fire, they are as often right as would be any more carefully-selected board of inquiry. When to their legal verdict the Coroner's jury proceed to add a recommendation, by way of "rider," with regard to what ought to be done to prevent future casualties of a kind similar to that which has been submitted to their discerning vision—this being a favourite exercise of these bodies—they frequently make themselves supremely ridiculous. A good example, both of a verdict and a rider, was supplied by the jury convened by the Coroner of the City of London to deliberate upon the cause of a fire which recently occurred upon the premises of a publishing firm in Blackfriars. There was not much mystery about this affair; an officer of the Fire Brigade being able to tell the whole story of how the fire must have originated through the dropping of a lighted match into a waste-paper basket that happened to stand underneath a desk and near a partition. The jury adopted this reasonable view of the matter; and there the inquiry should have ended. Something had been said, however, during the investigation, about the gas not having been properly turned off when the premises were left for the night; and thereupon the jury thought fit to add to their verdict the statement that, in their opinion, the manager of the place was "deserving of "severe censure for not having the gas turned off at "the meter." It is satisfactory to note that this uncalled-for and most mischievous "rider" was promptly overhauled by a correspondent of *The Times*, who wisely challenged it on the ground that, if allowed to pass, it might "do much to restore that most dangerous practice, "now happily dying out." This correspondent declares with reason that turning off gas at the meter "is the cause "of almost all the explosions that occur;" and he proceeds to give cases in point. This trick, which used to be a very favourite one of old-fashioned gas consumers, and is still practised by many householders who are too obstinate to take a gas engineer's advice in such a matter, is a striking illustration of the persistence of a bad habit in spite of continual exposure and denunciation. Economy is the imaginary motive that inspires the careful householder to wait up until everybody has gone to bed, for the purpose of turning off the gas at the meter—economy, and the utterly mistaken notion that it is safer to do this than to trust to separate burner-cocks. Then the householder has to make his own way to bed by the light of a candle; and he retires with the knowledge that, whatever happens during the night, he has effectually prevented the house from being lit up at a moment's notice. It is extremely difficult to drive into the head of a man who has once adopted this nocturnal habit, the conviction that he is doing his best to arrange matters for a disastrous explosion and to persuade him that, if he trusts to the burner-cocks, the meter will be found standing in the morning at the same figure as overnight. It needs a careful, anxious man to take the trouble to adopt the practice; and such men are usually obstinate in proportion to their caution. It is highly desirable, however, that this "most "dangerous practice," as *The Times* correspondent justly calls it, should be discountenanced by all available means.

A Disappointing Address.

The reputation of the Institution of Civil Engineers is not enhanced by the Inaugural Address of the new President, Mr. George Berkley, to which brief reference was made in the last issue of the Journal. With every desire to do honour to an oration of such historic renown as the address of the acknowledged head of the engineering profession of Great Britain, we could find but little in Mr. Berkley's observations that could be regarded as worthy of reproduction in our columns. The new President proposed to make his remarks bear upon "the advance of "engineering work in relation to social progress;" but his matter was the reverse of interesting, and his style deplorably halting. There may be branches of engineering upon which Mr. Berkley's speech could be regarded as throwing some light; but we candidly declare that we have been unable to learn anything from his observations upon engineering subjects in which we are either directly or indirectly interested. He said nothing whatever about the gas industry; and therefore we cannot accuse him of making any mistakes in this regard, or of treating the matter unworthily. On the subject of electric lighting, however, Mr. Berkley offered some passing observations of a character such as one might expect to find in a newspaper article. We hardly want the authority of the President of the Institution of Civil Engineers to support the oracular statement that "for the illumination of streets in "this country electric light has not yet proved so successful as it may hereafter become." It may be true that, "for lighting the interior of buildings, the coolness, freedom "from smoke and vitiation of the air, combined with the "convenience of application, will secure for electric lighting a great future;" but these are not the kind of statements that we look for from the Chair of the Institution. Even when we are told that "the requirements and the "great energy of the people have led to a large use of "electricity in America," there is an air of vagueness about the assertion that offends one's sense of the fitness of things. It is all very well to talk like this before a Mutual Improvement Society; but one expects occupants of the Great George Street Olympus to manifest a closer grip of the essentials of engineering theory and practice than can be traced in those portions of Mr. Berkley's address to which our attention would naturally be directed. It is no great matter, for once in a way. The brilliancy of all human institutions must have its periods of waxing and waning glory; and perhaps the Civil Engineers are yet destined to give the world as impressive orations as any that have appeared in their Transactions.

Trade Monopolies.

There is a good deal of senseless outcry in "popular" papers and by "popular" orators of all grades against "monopolies" in trade and in certain industries; and those who employ the term usually appear to think that when they have called an industrial venture a "monopoly," they have condemned it unanswerably. A similar order of ideas prevails among the callow economists who endeavour to win popular favour by abusing all "trusts"—meaning the association of producers of certain commodities for the purpose of preventing the selling price of such commodities falling unprofitably low. It is difficult to procure fair and free discussion of these matters; for those who are usually found arguing on one side of the question of unlimited *versus* regulated competition in trade, usually lie under the imputation of having a motive for what they say. It is therefore in the highest degree creditable to Sir Lyon Playfair, M.P., that, when recently addressing his constituents at Leeds, he took the opportunity of expounding his views upon economical questions in a style of candour that would appear injudicious in the highest degree to a mere party vote-catcher. Among other things, Sir Lyon Playfair talked about the Eight-Hour Movement, the State regulation of the relations between employer and employed, and the subject of manufacturers' combinations, or "trusts." There is no justification for alleging that Sir Lyon Playfair has any personal interest in defending these combinations; and, as a member of Parliament for a working-class constituency, he has every inducement to take the "popular" view of industrial questions. Sir Lyon Playfair, however, has no notion of taking his views of such questions from mass-meeting spouters and newspaper scribblers who do not know enough to go to school to him; and he proclaims his opinions with a clearness and sincerity which we believe will be appreciated at it true value by his constituents, who must perceive the difference between him and the ignorant demagogues who usurp the position

of instructors of the labouring classes. We may have another opportunity for discussing Sir Lyon Playfair's remarks upon the Eight-Hour Question. For the present, we only desire to make mention of his acknowledgment of the utility of concerted means for preventing the depreciation of the selling price of commodities by wild competition among manufacturers. The selling price of a manufactured article is the fund from which profits and wages must come. It is an illustration of the short-sighted inconsistency which characterizes a great deal of the "popular" politics of our day, that the same publicists who loudly denounce the "monopolist" gas company, are filled with indignation at the starvation rates of wages paid in those trades, such as match making, in which competition rages unfettered. What conceivable good does it serve that matches are sold at the current prices, at which hardly anybody engaged in the trade can earn a living? British, Italian, French, and Swiss match makers are engaged in starving one another under the operation of that same freedom of industrial competition which "popular" politicians extol, when they denounce Gas Companies working under statutory regulations, and vilify the manufacturers who are wise enough to agree not to undersell each other. Do they wish us all to be as the match-box maker whose case found mention in the newspapers the other day, who had to make boxes for 2½d. a gross, "finding his own paste and string"? It is high time there was a "match trust," or some such arrangement, whereby the poor folk who follow this trade —one of the latest in the annals of industry—may be delivered from their hard lot as the "awful example" of the effects of international free competition. What have our perfervid anti-monopolists to say about this view of the subject?

Multiple Directorships.

In announcing, in last Tuesday's JOURNAL, the death of Mr. Charles Newton, "a member of the Boards of no less "than nine Gas Companies, and an Auditor of two," this statement respecting the multitudinous responsibilities of the deceased gentleman must have appeared, to those readers who had no personal acquaintanceship with him, as by far the most noteworthy point in our obituary notice. Mr. Newton was a worthy and respected gentleman; and we have no more to say now he has gone than we had while he lived concerning the way in which he discharged his multifarious duties to different Companies. With all possible reservation, however, of personal questions in regard to the administration of gas undertakings, we do think that the plurality of directorships, secretaryships, and auditorships in certain groups of gas undertakings wants more notice than it has received. It is with gas supply as with railways; compact bands of gentlemen of the directorial persuasion help one another to all the good things they can lay their hands upon. The term "log-"rolling" is weak to express the easy way in which these expert individuals assist one another in elections to the various offices in and about Gas Companies which separately may be worth little, but collectively bring in such pretty rewards. It is all right, or, of course, it would not happen so. These associated Chairmen, Deputy-Chairmen, Directors, Secretaries, and Auditors are "all "honourable men;" and how they manage to remember, when they meet upon their various and sundry Boards, that Mr. A., who was yesterday Chairman, is now a Secretary, and five minutes hence will be an Auditor, is their own affair. It must need something of the talent of a "lightning-change artist" to act these quickly-recurring parts without confusion; but the task must be easier to those who grow into the work gradually. It is all very satisfactory, no doubt, as we have already admitted; and we do not desire to upset the smoothly-working arrangements by which so much of the British and Foreign gas business is carried on. All the same, it is as well for those whom it may concern to be reminded occasionally that directorial pluralities do not escape notice; and that arrangements of this kind, while they may be suffered upon the presumption that they work well, are certain to be visited with exaggerated severity when anything goes wrong. In the case which suggested these remarks, the gentleman had no private business or salaried employment, and was therefore free to spend his time in going from Board-room to Board-room without laying himself open to the charge that he might be better engaged. When, however, as in some instances, gentlemen actively employed in official work, which might be supposed to demand the whole time and energies of an ordinary person, figure on the Boards of half-a-dozen other concerns of more or less importance, the further question arises whether attentions which are so subdivided can be worth much in any quarter.

Masonic.—On Tuesday last, Bro. Aubrey M. Ohren (younger son of Bro. Magnus Ohren) was installed M.W. of the Frederick Lodge of Unity, No. 452—Province of Surrey—in succession to Bro. David W. Sugg.

Death of Mr. J. H. Cox, Jun.—We regret to record the death, on Monday last week, in Switzerland, of Mr. J. H. Cox, son of the Secretary of the Sunderland Gas Company, and President-Elect of the North of England Gas Managers' Association. It may be remembered that Mr. Cox was compelled, owing to ill-health, to leave England about this time last year; and consequently he could not take the presidency of the Association. Mr. R. Wallis, J.P., was accordingly invited to fill the position. It was hoped that the rest and change would restore Mr. Cox sufficiently to enable him to resume his duties, and confer further benefit on his colleagues in the Association by additional contributions to their proceedings. This, however, was not to be; and he has been removed at the early age of 28, at the outset of what was a most promising career—to the grief of his relatives, and the regret of many private and professional friends. Mr. Cox received his education at Repton; and matriculated at the London University. He subsequently studied under Professor Garnett, of Durham University. He was an officer in the Third Durham Artillery Volunteers, a distinguished athlete, and much esteemed in social circles in the neighbourhood. Previous to his illness, he was engaged in the experimental lighting and heating of buildings by gas, on which subject he presented a paper two years ago at the meeting of the Association of which he was so near the presidency.

Automatic Metal-Testing Apparatus.—M. Emil Petit gave for the first time, at a recent meeting of the Société d'Encouragement pour l'Industrie Nationale, particulars of his antheximetre —an instrument designed to automatically register the results of tests of the resisting powers of metals and cables. The apparatus was first used in the Commentry Mines, where numerous experiments have fully established its utility. The instrument employed at Commentry has a capacity of 60 tons; but there are types in use of 30 tons and 100 tons, which will indicate the various test results to a very low unit. The chief feature of the invention is a cylindrical float filled with water, which is itself enclosed in a cylinder, where it is free to move in any direction. This cylinder, which has an ascending action, is brought into connection with a steel-yard, and, being coupled with a hydraulic press, a spring movement is thereby produced, the natural action of which, at each instant of applied power, holds the equilibrium, and at the same time records the measurement. The cylindrical arrangement transfers its vertical movement to a tablet, on which the results obtained are registered. In the meantime, a pencil, which moves in proportion to the variations in distance between two selected points on the test-pieces, marks a curve, the ordinates of which are proportional to the various power values, while the readings correspond to the respective variations in the dimensions which it is desired to ascertain. The antheximetre is perfectly automatic; and it can be readily adapted to any desired class of tests.

The New German Patent Law.—Mr. J. C. Chapman (a chartered patent agent) has called our attention to the fact that a new patent law came into force in Germany on the 1st ult., whereby important changes of considerable value to inventors are effected. According to the provisions of this law, an invention is considered new if, at the date of filing the application for the patent, it has not been so described in public prints within the last century, or so publicly employed in the German Empire that its use by persons skilled in the art appears possible. The official foreign patent specifications are only considered equal to public prints after the lapse of three months from the date of publication, in so far as the patent is applied for by the foreign patentee or his legal successor. This exception only refers to the official publications of those States in which (according to an official Gazette) reciprocity is guaranteed. Formerly an invention was not considered new in Germany if it had been described in any printed publication, or publicly used in Germany, at the date of the application for the patent. If a patent is granted for a process, its scope is extended to the direct products of the process. In connection with the new law, a very much more satisfactory system of examination of applications is provided; a permanent staff being appointed, and each examiner confined to his own department. Another new departure is a "Law for the Protection of Useful Models." All kinds of tools and implements which cannot be patented, can be protected by this law, even, in many cases, the subjects of refused patent applications. A most important provision is that applications are accepted without examination. The protection lasts six years, and promises to prove of value for all kinds of small inventions not perhaps worth patenting fully.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 960.)

THE past week opened very badly, and with every prospect of being as adverse as its predecessor. Prices were steadily forced down; and it did not take much to depress them. The cause was still the same—the Continental bourses setting the tune to which Capel Court danced. Paris was the point which attracted most attention, and from which most was feared. By Thursday, however, it was rumoured that the expected danger was averted; and this rumour being afterwards confirmed, the market experienced quite a sense of relief. The consequences were an immediate recovery and a firm tone at the close. How long this will last remains to be seen; for public confidence is not easily reinstated, as times go. There is no change in the Money Market, and appearances point to continued easiness. The Gas Market has been quieter for the most part; but a good deal of business was done in the choicer issues by way of investment. Quotations are practically quite unchanged; but the tendency seems to be towards increased firmness. Gaslight "A" opened at 217; and after hovering for a day or two at about that figure or a little better, it commenced to advance; and before the close it was marked more than once at 219½. The debenture and preference issues were very active at old prices; while the "B" improved 1. One single transaction in South Metropolitan "B" on Saturday, at 223, was the only business done in that Company; though buyers would not be wanting if the stock could be had. Commercials were not dealt in at all. There was rather more business (as compared with recent averages) done in Suburbans and Provincials; but the prices marked were not particularly good. The Foreign undertakings have shared the general quietude for the most part; the only one to exhibit any degree of activity being Continental Union. In their case also prices were not above the average. Limited business was almost daily transacted in Water at reduced figures; and nearly every company shows a slight falling off in quotations.

The daily operations were: Business in Gas was extremely restricted on Monday; the entire day's transactions being limited to three bargains in Gaslight "A" at about middle prices. Water opened weak, and experienced a general fall. Chelsea receded 1; East London, 2; Grand Junction, 1; Lambeth, 2; ditto, 7½ per cent., 3; Southwark, 2½; and West Middlesex, 2½. Tuesday was much more active—in fact, the busiest day of the week. Gaslight issues of all descriptions were dealt in more freely, and prices looked more promising; but little else was touched. Water was steady. Business in Gas was less extensive on Wednesday; but the general tone was good. Gaslight "B" rose 1. Water was unchanged, and remained so for the rest of the week. Thursday's transactions in Gas were noticeable only for the signs of improvement in Gaslight "A." The same may be said of Friday; the closing price of Gaslight "A" being equal to the best of the week. The secured issues continued to change hands at moderate figures. Saturday was brisk; Continental Union especially being in a state of activity. The buying price of Gaslight "A" was advanced 1; but all other quotations remained without any variation.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Swan Company—The Proposed Electric Lighting Installation for Finchley—St. Pancras in Trouble—Edison's Last Promise.

THE Swan United Electric Light Company have now completed their ninth year of commercial existence; and they propose to pay a dividend after the rate of 11 per cent. The increased prosperity of this Company, since they gave up lighting, and confined themselves to manufacturing lamps and the exploitation of their patent rights in all parts of the world, has been quite phenomenal. It is reported, moreover, that the Directors of the Company are contemplating without uneasiness the approach of the time when their monopoly of lamp manufacture must expire. Their business is said to be so well organized that they expect to be able to hold their own against all competitors when incandescent electric lamps become common articles of trade. In the Swan factory there are many divisions, and the workpeople who know all about one stage of the manufacture are as profoundly ignorant of the rest as any outsiders; so that there is no workman in the Company's employ who knows how to make a complete lamp. After the patent right has lapsed, the manufacture of incandescent electric lamps will therefore be carried on as a trade secret. The price of lamps of the ordinary description will probably drop to less than one-half the present figure; so that lighting companies will be better able to bear the cost of their customers' renewals. When this time comes, moreover, it will be easier than it is now to ascertain the truth respecting the economical duty of lamps, which is the doubtful factor in all computations of the cost of incandescent electric lighting.

Perhaps when next Sir David Salomons sets about calculating the comparative cost of gas and incandescent electric lighting, he will ponder some observations contained in the report by Mr. Francis Smythe, the Surveyor to the Finchley Local Board, upon a scheme of electric lighting for this parish. Mr. Smythe recommends incandescent lighting for the parish roads; but he is not unmindful of the unsatisfactory results that have always attended previous attempts of the kind, and he accordingly essays an explanation of the reasons why he expects to do better in Finchley. He thinks that incandescent lamps appear dull out of doors because they do not diffuse their light so well as gas-flames of nominally equal illuminating power; and therefore he advises that 32-candle incandescent lamps should be used in place of the ordinary street gas-burners. For indoor use, however, Mr. Smythe thinks that 8-candle incandescent lamps will efficiently displace the gas-burners ordinarily used. It is very evident that a little play of fancy of this kind is of great assistance in the preparation of electric lighting estimates. Mr. Smythe "lets himself out," however, when he casually remarks, in the course of his report to his Committee, that he has "charged 6d. per unit for private lighting, which would be equivalent to local gas at 3s. 6d. per 1000 cubic feet." This beats Sir David Salomons. We always thought that electricians were prepared to admit that incandescent lighting is a little—just a very little—dearer than gas; but Mr. Smythe's zeal outruns his discretion. We understand that the Finchley Local Board have decided to act upon this estimate, and apply for a Provisional Order to carry it out; but perhaps, before actually spending the ratepayers' money upon a mere supposition, they will not be above taking a hint to inquire at Bradford as to what electric lighting by a local authority really costs.

The St. Pancras electric lighting project came before the London County Council at their meeting last week, upon a request from the Vestry for a loan of £60,000, repayable in 42 years, to be devoted to this purpose. The Finance Committee of the Council have had the matter under consideration; and they naturally concluded, to begin with, that the time over which the Vestry proposed to spread the repayment of this money was considerably too long. As a matter of fact, the Council have no power to advance money to Vestries, for works other than street improvements and bridges, for more than 30 years; and as, in the case in point, many of the things for which the money is to be spent—such as engines, dynamos, &c.—cannot be supposed to last longer than half this period, the Committee have considered that the period of repayment ought to be limited to the assumed life of the respective works. They agreed, however, that, in consideration of the works being expensive and unremunerative at the outset, the repayment might be deferred for a period of two years. Of course, this prudent counsel did not suit the representatives of the parish of St. Pancras, who would doubtless be glad to spread the necessary repayment over 60 years, or more; and, in the circumstances, it is understood that the Vestry will take steps to obtain parliamentary sanction for the longer period of repayment they desire, in which they may or may not be opposed by the County Council. We are inclined to believe that the Finance Committee of the Council have taken the correct view of this matter; and we doubt whether Parliament, in face of the growing uneasiness with regard to the tendency of local authorities to foist their financial obligations upon distant posterity, will overrule their judgment. Consequently, the probability is great that St. Pancras will have to pay for its electrical toy during the period that may be reasonably supposed to elapse before it wears out. There should not be any difficulty in arranging for this, if the report is true that the district is almost gasping with anxiety for the light. Surely a parish so well able to afford this luxury will not mind the extra halfpenny or so per unit that will enable the existing generation to pay off the capital debt.

It is again reported, with a little more regard to detail, that Mr. Thomas A. Edison has solved the problem of electrical locomotion, or rather of the application of electricity to the working of railways; and the system is to be demonstrated on the lines between Chicago and Milwaukee during the Exhibition year. By this system the locomotive horse power is to be produced by stationary engines for a consumption of from 1 lb. to 2 lbs. of coal; whereas the engines now running consume 6 lbs., of coal per horse power. Moreover, trains are to run easily at a speed of 100 miles per hour; the work of the driver being reduced to keeping a look-out and minding his brake. There will be no waiting for trains, even for the longest distances, because the trains will be short and frequent. All that Mr. Edison will say at present about his method is that the current will pass from stationary engines to a central rail between the metals, from which the power will be taken for driving machinery attached to the bottom of the car. There is, of course, nothing very startling about this general plan. And, we may also say, there is nothing absolutely impossible about the ideal thus held forth. It is always more easy, however, to believe in the impossible than in the merely improbable, as Dickens illustrated long ago by his striking story concerning the adventures of Mr. Solomon Gunn. There will be very great difficulty indeed in the way of a general acceptation of Mr. Edison's new claim, until its validity has been proved beyond the possibility of cavil, even if the history of the phonograph is conveniently ignored by Mr. Edison's admirers.

A POINT OF PATENT LAW.

It is with no intention of discussing the merits of the case in point, that we direct our readers' attention to the observations upon the general subject of the nature of good patents and what constitutes an infringement, which occur in the arguments and judgment in the Wenham appeal case reported elsewhere. The purely individual interests involved in the upholding of, or the successful attack upon, any particular patent concern only those whose property is involved in the issue. No patentee can, however, regard unmoved a conflict in the Courts respecting points of patent law which may touch him as nearly as they do the parties to the action; and when, as in the case mentioned a matter is taken from a single Judge to the Court of Appeal, it is of the highest interest to follow out the lines upon which judgment is finally given, in order that one may learn a little more of the methods by which Judges arrive at decisions so momentous as those which affirm or annul the patents that lie at the foundation of important special industries. The instance in question happens to be a particularly good example of the conflict of commercial interests that almost invariably attends the exploitation of a patented invention. A patented novelty is rarely put upon the market without more or less preliminary and incidental outlay which is not directly represented in the merchantable article. There is generally a wide gap between the inventor's first idea and the commodity in which it finds its ultimate expression; and this gap must necessarily be fenced round by more than one supplementary patent. At last, when the article of trade which is the fruit of all this creative effort has been put into what is to remain its permanent shape, those who own the property are compelled, for their own protection, to revise their patents; and, by disclaiming here, dropping there, and generally cutting and trimming their fundamental claims, they endeavour to put themselves in a safe position to withstand the assaults that commercial prosperity always invites. Meanwhile the enemy is busy. Unprofitable patents are perfectly safe; but no sooner does a patented article find a ready sale than it becomes a bone of contention. The inventor is lucky indeed if, in his original first specification, and in all that he may do afterwards until he succeeds in making something marketable, he can be assured that he properly described his invention, that he claimed enough and not too much, and that he kept clear of all the pitfalls that stud the path of the industrial innovator. At any rate, these are questions that the inventor who also makes a paying business out of his notions is seldom absolved from having to answer at his peril. In the ordinary way, the possession of a valid patent is assumed, until the contrary is forcibly demonstrated, and is depended upon for the protection of the patentee, or of his assignees, while they sell their commodity at a price higher than would be obtained in open competition.

This uncommercial price acts as a constant temptation to the commercial world, which sees the patentee obtaining for his productions prices very far in excess of the trade value. It is nothing to rivals in business that the patentee has sunk money in bringing his commodity into its merchantable form. The progress of manufacture is from the complex and costly to the simple and the cheap; and when this development has been brought about, it is not always easy to retrace from the fruit back to the germ. Consequently, the way of the infringer is easy. All he has to do is to take the most popular form of the commodity in which he desires to deal, and, slightly altering the pattern, put it upon the market as his own. He will be proceeded against, of course; but then he merely pleads that the patent which he is accused of infringing is not valid, and this throws upon the other side the onus of proving that their claims are sound. We say nothing about the copying of a patented article, which is a different proceeding from infringing it. A copy is clearly indefensible if the original is safely patented; and copiers can only escape being visited by dire penalties by demonstrating that the patent is altogether bad and void. The distinction between infringement and improvement is so nice, however, that when litigants in patent cases join issue upon such points, the result is often as open as a lottery.

It is by no means easy to distinguish the general principles which guide Judges in giving their decisions upon points of law. To laymen, the English law seems to be hopelessly unsystematic, and the principles which it does exhibit are remarkable mainly for the ease with which they may be misunderstood by different parties to the same issue. The Wenham judgment, however, certainly brought into prominence one leading principle in regard to the discrimination between infringements of, and improvements upon, patented inventions, which calls for special notice. In deciding a well-known leading case, the late Lord Cairns used the phrase "the pith and marrow" of a patented arrangement, to designate the central idea which, after it has been properly described in a patent specification, must not be paraphrased by anybody but the patentee. Anyone is at liberty to improve upon a patented invention; but the improvement will be held to be also an infringement if that which differentiates the invention from any other arrangement is taken, or the substance of it. This is Lord Justice Lindley's gloss upon Lord Cairns's dictum about the inviolability of the "pith and marrow" of an invention. Lord Justice Bowen was still more explicit; and his words imply such a limitation of the idea of improvement, as usually understood in connection with inventions, that they demand the most careful study by everybody interested in the subject—that is to say, by the whole mechanical and industrial world. According to this eminent legal authority, when an action for infringement is in question, the first thing to be settled is what is the real invention comprised in the combination or the process—what is its "pith and marrow." Having discovered this, as disclosed in the patentee's specification, the next question is whether it is properly described—neither ambiguously nor too largely. These important points being settled, the next query is whether or not the patent is infringed. The Judge asks himself whether the "pith and marrow" of the invention has been taken. "If so, it is no excuse to say that something has been added or omitted, even though the addition or omission has been useful or valuable. The superaddition of ingenuity to robbery would not make the robbery justifiable." It must be agreed that these expressions are calculated to "give pause" to those ingenious persons who are prone to look upon all useful inventions in their particular line of business with an eye to the possibility of improving upon them.

There is no hard-and-fast rule in this matter. An improvement of a patented invention may be at the same time an infringement of the patentee's rights; but all improvements are not necessarily infringements. In the example of a gas-lamp, for instance, it may be "the pith and marrow" of an invention to supply heated air to one side of the gas-flame, with the object of increasing the illuminating power of the gas consumed by this flame. Somebody else may perceive a neater way of doing this than the method which the inventor has hit upon for the same purpose. It is hardly too much to say that nine out of ten practical workers, even of those who have had some experience in the Patent Office, would declare off-hand that this neater way of attaining the desired end would constitute good ground for an improvement patent. According to the judgment which we have under notice, however, this view is erroneous. Another than the patentee may scheme a plan for simplifying and cheapening the construction of the latter's patented arrangement; but, to revert to the illustration, so long as the method followed is substantially the same as that described, and properly described, in the patent specification—so long as the heated air is supplied to one side of the gas-flame in the manner indicated—the mere improvement of means does not justify the appropriation of the essence of the invention.

It may be remarked by some critics that this dictum of Lord Justice Bowen's approaches perilously near to a declaration that a principle is patentable, which is, of course, in opposition to all accepted notions of what is fit subject-matter for a patent. We cannot discuss this observation. It is enough for the present to emphasize the fact that the judgment now in question appears to strengthen the position of patentees, and to warn would-be improvers to be careful lest their attempts turn out, upon examination, to be distinctions without sufficient difference. This is essentially a question of degree; and it is naturally impossible to say, in general language, to what extent the prior claims of a patentee may be held to hinder later comers from attaining his object in a more acceptable way. We should be inclined to think that any difference of method which materially cheapened an arrangement, and therefore made it more widely available for public use, would be construed by the Courts as a substantial improvement, and consequently patentable. The difference, however, would probably be required to be very marked, and to show something more than a mere manufacturers' advantage. Otherwise an inventor devoid of mechanical training might be robbed by the first skilled workman who should happen to see his arrangement, and be able to suggest a short cut to the end desired, without improving the effect.

The course of mechanical and industrial progress is a history of inventions and of their improvement—especially the latter. The number of fundamental inventions is small indeed in comparison with that of the devices whereby these are perfected and made serviceable for the work of the world. It is but natural that the "true and original inventor" should look with feelings of enmity upon the crowd of would-be improvers who tread upon his heels and try to snatch from him the rewards of success in dealing with problems which he was the first to successfully attack. It was not Columbus, however, who colonized the New World; and there is plenty of work for the adapter of new ideas, as well as for propounders of them. Many inventors suffer from the plague of improvers; but the world would be without innumerable conveniences to-day if ideas had been convertible into private property, as well as suggestions of methods for carrying them out. To the whole race of adapters and improvers, who throng the Patent Offices of the world after every new development that is struck out by an original mind, we take leave to commend the words of Lord Justice Bowen, when he remarked that to improve stolen property does not excuse the theft.

While upon this subject, we may take occasion to draw attention to the injury that is frequently done to meritorious inventors by the rush into the Patent Office of would-be "improvers," with notions which are in general only proposals for reaching the ends of the original patentees by alternative ways. No sooner does an inventor solve a previously hopeless problem, or disclose a promising opening for industrial development, than a pack of schemers are at his heels, intent either upon usurping his rights or upon being bought out by him or his

supporters. Some people are wise enough to recall the saying, in this connection, that "imitation is the sincerest form of flattery;" but others, there is only too much reason to fear, are frightened away from truly worthy novelties, by the crowd of self-styled "improvers" whose interested labours fill the Patent Office Journal. It is thought, in many instances, that an invention must needs be very imperfect when so much ingenuity is required to make it go. This is an altogether gratuitous assumption, and is calculated to hinder true progress. We have here, moreover, an additional piece of evidence, if such were needed, in support of the view that activity in the Patent Office is not necessarily connected with real industrial progress. Many applications for patents are only manifestations of a desire to hang on upon the skirts of successful inventors, which is a weakness of the small fry of the industrial world. Veritable "epoch-making" inventions are few and far between; and whenever they appear, they resemble comets—in dragging after themselves a large, but useless and tenuous, tail.

DEATH OF MR. J. K. WATSON.

Mr. John Kippen Watson, F.R.S.E., who was for many years Treasurer and Manager of the Edinburgh Gaslight Company, died at his residence, No. 14, Blackford Road, Edinburgh, on Monday, the 16th inst. He had reached an advanced age; and practically the whole of his long life had been spent in the service of the Edinburgh Gas Company. Mr. John Watson, his father, was the first Treasurer and Manager of the undertaking; and the son, succeeding him, held the office down to the dissolution of the Company in 1889, after the works had been acquired by the Edinburgh Corporation. Mr. J. K. Watson was a short time in the Teinds office; but, while still little more than a lad, he entered the office of the Gas Company as junior clerk. At first promotion with him was slow; and it was some years before he attained even to the position of Chief Clerk. That post he held till, on his father's retirement, he was appointed by the Directors to take his place. In the earlier years of his connection with the Company, the late Mr. Watson was in the habit of going to the gas-works early in the morning to study gas making. He thus acquired an acquaintance with the practical side of the gas industry; and when he came to hold the reins of authority in the office, he was able, down to about 15 years ago, to superintend the works also. In this capacity he designed the remarkable chimney-shaft which, for height and symmetry, is a conspicuous feature of the works in the North Back of Canongate. After Mr. R. Mitchell's appointment as Engineer, Mr. Watson ceased to look after the works personally. He continued, however, to hold the office of Treasurer down to the end of the Company's existence. On the transfer of the undertaking to the Corporation, in August, 1889, Mr. Watson retired. His health had lately been failing; and a portion of last winter he spent in the South of France. During this year his strength gradually declined; and he at last succumbed to the infirmities of age. Just before the transfer of the works, the Directors of the Company offered him the alternative, on retirement, of a single payment of £10,000 or a pension amounting to his full salary of £1300 per annum. He accepted the latter; and under this arrangement drew only about £4000 from the Gas Commissioners. Had he taken the £10,000, it would, of course, have been the gift of the Company. It is possible, however, that it was Mr. Watson's high sense of honour which compelled him to choose the pension rather than the honorarium. He was upright to a degree which by many men in a public office would be regarded as fastidious. This sentiment he expected in others; and, though kindly and considerate to those under him who did their duty faithfully, he could not tolerate any who did otherwise. The result was the maintenance of a high standard of discipline in the staff. Mr. Watson's guiding principle was to conduct the affairs of the Company upon as low a capital as possible, so as to give greater freedom in competition. His success in this was shown in Mr. George Livesey's evidence before the House of Lords Committee in March, 1887, when he stated that the capital of the Edinburgh Gas Company was £2 8s. 1d. per ton of coal carbonized, as compared with £4 4s. in Leith, £4 8s. in Glasgow, and an average of £6 7s. for the whole of the United Kingdom—Plymouth being the only place lower than Edinburgh. On the same occasion, Mr. Watson himself stated that their capital expenditure had been £414 for every million cubic feet capacity of the works and plant. Mr. Alfred Lass, F.C.A., who was called upon by the Committee to report on the Company's books, explained that this low figure was attained by accumulating profits from time to time, and using them in the business. A narrative of Mr. Watson's life would be practically a history of the Edinburgh Gas Company during the long period of nearly fifty years which he served it. Mr. Watson is survived by his widow and by two sons—one in medical practice in the South of England, and the other a Chartered Accountant in Edinburgh.

Bombay Gas Company, Limited.—We understand that Mr. W. B. M. Lysley has retired from the Board of this Company, and that Mr. H. E. Jones, who was appointed an Auditor (in place of Mr. R. King, deceased) at the ordinary general meeting in May last, has been chosen to fill the vacancy. Mr. Magnus Ohren succeeds Mr. Jones in the auditorship.

THE LATE MR. DAVID LAIDLAW.

A Chapter in the History of Gas and Water Engineering.

It has fallen to the lot of comparatively few persons to have had so long, prominent, and intimate a connection with the gas industry and with water engineering as that which can be claimed for the gentleman whose name stands at the head of this notice, and who, as briefly recorded in the Journal for the 10th inst., has lately gone to his rest in the fulness of years. To have known Mr. David Laidlaw intimately, and more especially in the last fifteen or twenty years of his interesting life, was quite an education in itself, and something to be really proud of; for, with scarcely a single exception, there are no persons now living whose active connection with the manufacture and distribution of illuminating gas goes so far back into the past as he went. Twenty or thirty years ago, almost every gas and water engineer and director in the kingdom knew the worthy gentleman of whom we speak; but within that time a new generation has arisen, and consequently acquaintance with his firm has been obtained and maintained through younger representatives—sons, grandsons, and other partners and travellers.

The firm which now bears the name of Messrs. R. Laidlaw and Son dates back into the last century, and has, indeed, been established about a hundred years. It was in Edinburgh that the business of the firm was begun by Messrs. J. and R. Laidlaw, who were the uncle and father of the gentleman lately deceased, who, after the death of his uncle, was assumed by his father as a partner in 1837, when the style of the firm took the present shape. The business originated at a time antecedent to the commencement of the gas industry. But the partners soon became alive to its importance; and the result was that they threw themselves with energy into the manufacture of the various fittings rendered necessary by the use of the new illuminant. This was in Simon Square, Edinburgh; and it is interesting to know that it is at the same place where a large portion of the firm's extensive business is still carried on—namely, the manufacture of gas meters and burners, burners for paraffin lamps, gaseliers, gas-brackets, and gas-fittings generally. The Simon Square works are so extensive that they usually give employment to about 300 workpeople.

It was in the year 1841—half a century ago—that Messrs. R. Laidlaw and Son commenced business in the Western Metropolis of Scotland, by opening a warehouse in Argyle Street—then, as now, the principal thoroughfare of that busy city—for the sale of meters, gas-fittings, &c., for their factory in Edinburgh. The west country branch of their business was found in the course of three or four years to have become so important, that the firm forthwith proceeded to erect works in Glasgow for the manufacture of wrought-iron gas-tubing, gas-fittings, &c.; and the late Mr. David Laidlaw took charge of this establishment from the first. Glasgow has ever since been the headquarters of the firm's business enterprises. They soon afterwards added to these works by building a foundry for making gas apparatus, small cast-iron gas-pipes, and such other goods as were required in their business as gas engineers. We ought to mention that Mr. David Laidlaw soon became the head of the firm by the retirement of his father, who died in 1884, and never took any active part in conducting the Glasgow department of the business; and it is certainly due to his memory to say that to his great energy, force of character, untiring diligence, and commercial integrity, is owing the fact of the business becoming so extensive, and the firm acquiring such a world-wide reputation.

In course of time—namely, in the year 1858—the great works at Barrowfield, in the east end of Glasgow, were established, chiefly by Mr. David Laidlaw, and carried on for a considerable period by the firm of Messrs. Laidlaw, Sons, and Caine. In these works the designing and construction of gasholders have long been pursued on an extensive scale; as also the manufacture of purifiers, iron tanks, gasholder columns, girders, roofing, &c. At this establishment there is one of the largest and best equipped foundries of its kind in Scotland. Within its casting-pits there have been produced gasholder columns in lengths of 19 ft. 6 in.; and other feats of great productive capacity have frequently been recorded. The Barrowfield Works, and the Alliance Foundry and Engine Works are well known by name to all old gas engineers both at home and abroad; and they each bear the stamp, in a large measure, of the master-spirit who had for so long a period the active control of the business. But there are other works, besides those mentioned, where the manufacturing operations of Messrs. R. Laidlaw and Son are prosecuted. One of these is the Broomhill Foundry, where machine-made gas and water pipes and valves and fittings are produced on a large scale. The firm had long desired to be in a position to make and supply every article required in the manufacture, purification, testing, storeage, measurement, distribution, and consumption of illuminating gas; and they acquired Broomhill with the special intention of erecting works to produce machine-made pipes of large size. By doing this, their desire was fulfilled; for they have long been able to turn out pipes of this kind up to 48 inches in diameter. At this establishment in ordinary times, there are generally about 200 hands employed. The other foundry is at Lambhill, a few miles outside the city on the line of the Forth and Clyde Canal; and at this, which is probably the largest greensand

pipe-founding works in the kingdom, there are not unfrequently about 150 workmen engaged. Including the workpeople at the Alliance Foundry (where pumping-engines, gas-exhausters, and motors of many other kinds are made), the firm give employment generally to about 2000 hands, while very often many more are engaged in the execution of contracts outside.

The enormous development of the firm's business in gas and water engines was, as already remarked, largely due to the enterprise of Mr. David Laidlaw. During the decades 1850-60 and 1860-70, he travelled up and down the United Kingdom and over the Continent of Europe; and the kind of business in which he was engaged, and to which he was so long most devoted, perhaps never had a representative who was so much from home executing important contracts, or engaged in the pioneer work of stimulating governments, municipalities, public companies, &c., to establish gas and water works where he thought they were actually, or soon would be, needed, There are many places, in the three kingdoms and abroad, where interesting tales could be told of the almost magic influence which Mr. Laidlaw brought to bear on such bodies as those just referred to; and if there was a possibility of any business being done, he was almost certain to return home with the signed contract in his pocket. He had the good fortune to secure many concessions in Italy and other parts of Europe.

Lastly, we may remark of the late Mr. Laidlaw that he had for some time been quite free from business activity, and that, had he lived till the 31st of December next, he would have completed the 82nd year of a very busy and useful life.

Manchester District Institution of Gas Engineers.—The eighty-eighth quarterly meeting of this Institution will take place next Saturday, at the Grand Hotel, Manchester. According to the programme of arrangements which has been issued by the Honorary Secretary (Mr. S. S. Mellor, of Northwich), the business will comprise the election of two new members—Mr. J. W. Buckley, of Formby, and Mr. J. Wilkinson, of Pudsey—and the President for the ensuing year. The paper on "Differential Rates," read by Mr. T. Newbigging at the Birkenhead meeting in August last (*ante*, p. 396), will then be discussed. after which a paper on "Stoking Machinery" will be given by Mr. J. West, of Manchester. A paper on "Management" will also be contributed by Mr. Newbigging. At the close of the business, the members will, as usual, take tea together.

Steel Water-Mains in Toronto.—In the ast annual report of the Superintendent of the Toronto (Canada) Water-Works, Mr. W. Hamilton, there is an interesting description of the new steel conduits which have been constructed to increase the supply of water taken from Lake Ontario through the old 3-feet cast-iron and 4-feet wood intakes. The description was prepared by Mr. W. C. Brough, the Engineer of the department; and the following abstract is taken from the *Engineering Record*: The new submerged conduits are two in number, one 48 inches in diameter and 4660 feet long, the other 60 inches in diameter and 6027 feet long. The 60-inch pipes are made in lengths of 56 ft. 9 in.; and the flexible joints are 4 ft. 6½ in. long. These dimensions with the 4-feet pipes are 55 ft. 2 in. and 4 ft. 6 in. respectively. The steel used is ⅜-inch single-riveted Scotch boiler-plate. The flexible joints have a body of the same material as the pipes, with a cast-iron ball riveted on. A curved rim is riveted inside the socket, and filled with soft pig lead, which projects ⅛ inch beyond the rim, and works on the planned surface of the ball. In the total length of the 48-inch pipe, there were 65 of these flexible joints used, on account of the irregularity of the bottom of the harbour through which they extended. In places rock had to be blasted and dredged to a depth of 8 feet in order to conform to the proper grade, and to give a depth of 14 feet of water over the pipe to satisfy the requirements of the Harbour Commissioners. In the 6027 feet of 60-inch pipe, only 15 joints were considered necessary, as the trench dredged was in soft clay or sand, and could therefore be kept comparatively level. The 48-inch joints were riveted directly to the pipes. Where they were unnecessary, there was a steel sleeve riveted on, joining the two sections, and making a total length of one pipe of about 120 feet. The connections of the 60-inch pipes and joints were made by means of cast-iron flanges having a faced projection of ¼ inch. Inside this was a ¾-inch pipe packing, which was held in position by the faced projection on the inside and bolts on the outside; being first laced against one flange with wire. The majority of the bolted joints were made under water by divers after the pipe was nearly in its final position. The 48-inch joints, before being riveted to the pipes, were taken apart in the centre, by unbolting the flanges that encircle the ball; thereby separating the ball end from the socket end. The ball end was then riveted to one pipe, and the socket to the next. When the riveting was completed, the parts were placed in position with the ball lifted off the bottom to aid in adjusting the socket. Divers fastened the flanges together again as soon as the socket was placed in position. The 60-inch pipe began with a flexible joint. As the lengths of pipe were laid, the forward end of each was raised by blocks, so that when from five to fifteen sections had been rigidly riveted, their weight caused them to sink to the proper grade—the joint permitting this motion. When this occurred, another flexible joint was used; thereby taking the leverage off the preceding pipes, and preventing further settlement.

NOTES.

Influence Lighting and Phosphorescence.

Mr. J. J. Thomson, F.R.S., has described some remarkable light effects due to the discharge of high-tension electricity through bulbs filled with different gases. At the highest pressure at which the discharge passes through air, the light is reddish, and gets brighter and whiter at lower pressures. By far the most remarkable appearance is presented when the discharge passes through oxygen; for in this gas the bright effect of the discharge is succeeded by a phosphorescent glow which lasts for a considerable time—indeed, with a strong discharge, it may remain visible for more than a minute. When the discharges follow one another pretty rapidly, the phosphorescence is so strong that it hides the successive bright discharges; and the tube seems permanently full of a bright yellow fog. Thus, by the use of a lamp bulb filled with oxygen, the intermittent light of the bright discharge is convertible into a continuous one. A curious experiment was that of submitting a discharge-bulb full of oxygen at low pressure to the heat of a Bunsen gas-flame. Before the bulb had got hot, every bright discharge was succeeded by a bright after-glow; but as the bulb got hotter and hotter, the glow became fainter and fainter, and at last ceased to be visible. When the exterior source of heat was taken away, the glow reappeared. This after-glow yields a continuous spectrum. The only gas besides oxygen in which Mr. Thomson was able to detect any after-glow, is air; though in this case the range of pressure within which it is exhibited is exceedingly small. The glass of the bulbs itself is made to phosphoresce by these discharges.

Waterproof Wall Coatings.

Dr. T. Koller, of Munich, has published in *Glaser's Annalen* some useful information which he has collected with reference to the waterproofing of brickwork, concrete, &c. He strongly recommends whitewash containing a little common salt, which makes a waterproof wash. The peculiar quality of this simple mixture was discovered by a curious accident. A labourer employed lime-washing in a private house, accidentally upset a salt-box; and in order to conceal the disaster, he swept the contents of the box into his pail. It was afterwards found out that the wash had set as hard as cement, and would bear being scrubbed. This led to experiments, among other tests being that of whitewashing the walls of a well, the material being applied with a syringe where a brush would not serve; and in this case the salted whitewash was as good as ever four years after application. Dr. Koller attributes this curious effect of adding salt to limewash to the absorption of water by the salt, thus enabling the lime to combine with the carbonic acid of the atmosphere and form a hard and durable coating. For waterproofing buildings much exposed, a solution of melted paraffin in three parts of heavy coal-tar oil is recommended. This paint must be applied hot, which may be conveniently managed by keeping the paint-pot in a bucket of hot water. Water-glass, for waterproofing walls, has fallen somewhat into discredit of late, which Dr. Koller ascribes to improper usage. The composition should be applied as follows, after the walling has had abundance of time for setting: Ten parts of sharp, dry sand; three parts of air-slaked lime; two parts of chalk or pulverized limestone; and soda water-glass of 33° Beaumé are the ingredients. The water-glass is diluted with twice its weight of water; and the other materials are then mixed with it, until it has about the same consistency as mortar, in which state it is to be applied to the wall surface. In a day or two the coating becomes as hard as stone, after which one or two more coats may be laid on.

Economical Boiler Fuel.

At Guinness's brewery in Dublin, a noteworthy attempt is made to obtain steam economically, both by the use of cheap fuel and also by the firing arrangements. A battery of three multitubular boilers is to be seen here, which are so set that the furnace gases, after having passed through the tubes, are led through a heater for warming the air supplied to the fires. A forced draught is necessary to drive the air through the heaters, the effect of which is to raise the fresh air to a temperature of 320° Fahr. before it enters the furnaces. A mixture of gas-works breeze and small coal is the fuel used for these boilers; and the stoking is done mechanically upon Carr's system. The evaporative capacity of the boilers thus fired is 920 gallons per hour per boiler, being equivalent to 8·2 lbs. of water per hour per square foot of boiler-heating surface. The mixed fuel is subjected to a coking process, and the fire-bars carry it into the furnace. There is practically no smoke; and the economy of the arrangement has not been secured at any sacrifice of efficiency. It is re-assuring in these times, when so much effort is being devoted to the popularizing of water-tube boilers, to hear of these instances of Lancashire and multitubular boilers standing their ground, and justifying the preference extended to them, on the score of their being efficient, smokeless, and powerful steam generators, when worked with the commonest kinds of fuel.

Steel Main-Pipes.

Mr. D. J. Russell Duncan remarks, in a paper read before the American Water-Works Association, that the application of steel in the construction of water-mains, although of comparatively recent date in Great Britain, has developed into a new and

important industry, which enters into serious competition with the pipe founders. Wrought iron was never so popular with English engineers as it has long been in the States; but the lightness and strength of steel have recommended this material for water-mains for all parts of the world. With regard to the preservation of steel pipes from rusting, Mr. Duncan says that the best precaution is to have them galvanized, and then coated with natural asphaltum; or, when the latter is not procurable, with a specially prepared composition of pitch, tar, petroleum, linseed oil, and chalk. This gives a smooth, glassy surface, which sets hard. Whenever possible, however, pipes should be coated again as laid in the trench, to repair abrasions caused during carriage and handling. Weight for weight, a mild steel pipe is 3·48 times stronger than a cast-iron pipe; and if only about 0·77 of the thickness of a wrought-iron pipe, it will have the same strength. The bursting pressure of a pipe is equal to the thickness of the metal multiplied by twice the tensile strength of the material, both in the same denomination, and divided by the diameter. It is fair to take the strength of steel used for this purpose at 65,000 lbs. per square inch; but the most recent practice in England is to take an ultimate strength of 60,000 lbs., and allow a margin of safety of 5—which with various deductions for riveted seams, unequal rolling, &c., brings the working strength of the material down to 8100 lbs. for high-pressure, double-riveted pipes, and to 3420 lbs. for single-riveted low-pressure pipes.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

(*Continued from p.* 846.)

PART II.—MODERN PROGRESS IN SCIENTIFIC LIGHTING.

We now proceed to consider the practical questions that arise in artificially lighting outdoor spaces and interiors, and trace the growth of the scientific method of treating them. In outdoor lighting, two objects are sought—the exhibition of beacon lights, and the rendering of roadways and pavement surfaces sufficiently light for the different purposes of locomotion, performing outdoor work, promenading, &c. To some extent, the same remark as to the different degrees of lighting required for various purposes applies to the lighting of interiors; but, indoors, beacon lights are of comparatively small importance in comparison with those which are needed to subserve another end besides being merely visible in themselves. The former may be described as confined to corridors and stairways infrequently used, where it is only considered necessary to show the position of sharp corners, landings, &c., for which purpose a glimmering watch-light is sufficient.

It would be justifiable to describe all street lighting down to the beginning of the last decade as having been either of the *beacon* or of the *decorative* order. The former was by far the most general, and still remains so, for obvious reasons. The lighting of streets and roadways by lamps exhibiting lights of such small intensity, and at such distances apart, that the areas noticeably illuminated round the bases of the lamp-columns, or underneath the wall-brackets, as the case may be, do not meet one another along the line of thoroughfare, must be characterized as of the beacon order, for then the vision of the lights themselves is their principal point of utility to the wayfarer. They show the direction of the roadway, the position of corners, crossings, inclines, curves, and any other important topographical features of the thoroughfare, purely as beacons. The general knowledge thus gained by the passenger is supplemented by what he can see by the light of a single lamp when he passes near it, which shows the details of the kind of road-surface, the presence or absence of side-walks, the condition of the pavement—whether sloppy or dry, sound or uneven—and discloses other information by which the foot or vehicular traffic is almost unconsciously guided from lamp to lamp; receiving new impressions, or confirming or correcting old ones, at every succeeding point of positive lighting.

The assistance afforded to the wayfarer by street-lamps, although these may be few and as far between as convention allows, is therefore anything but despicable. If a roadway were provided only by beacon lights like a sea coast, it would still be better for night traffic than an unlighted road in a degree that approaches the infinite. The poorest street lighting is better than this, however, for the lamps are always available for enabling the passenger to read the address on a card; and the areas of their light furnish timid pedestrians with successional oases of comfort, wherein they can enjoy a sense of comparative security from molestation by "nightbirds." In view of the very considerable expense of street lighting, even of the most economical description, as exhibited in suburban thoroughfares, it is as well to bear in mind the real requirements of such roadways in this regard. If this is done, and the public lighting of roads is judged in all cases upon the necessities of the traffic, and not by contrast with what may be seen in other instances, the beacon system of lighting will be found easily defensible against inconsiderate criticism.

Until the recent period already referred to, public street lighting (as already remarked) was all of the "beacon" order, when it was not decorative, inasmuch as no attempt was ever made to apply any standard of measurement to the light afforded by the lamps upon the road surface. Streets and squares, gardens and promenades, were spoken of arbitrarily, even by professional men, as well or badly lighted, according as the lamps were thickly or sparsely placed, and supplied with gas-burners consuming the beggarly 3 feet, or the respectable 5 feet of gas per hour. It is not the purpose of these articles to give the history of the improvement of street gas-lamps and lighting. It is enough to point out that at the period (1873) when Mr. Skelton was endeavouring to interest the British Association of Gas Managers in his "Catoptric" lanterns, nobody cared to know how much or how little light streets and roads actually received from the ordinary lamps. In a paper read before that Association in 1877, Mr. R. W. Brett could only say on the subject of the sufficiency of street lighting as then practised, that "lamps with a fair light and a fair way to shine should not be more than 70 to 80 yards apart; but we find, in the densely populated City of London, 20 yards often nearer the mark." Neither Mr. Brett nor those gas managers who discussed his paper, allowed any remarks to escape them indicating that they entertained an idea of street lighting beyond the 5-foot lamp. This was very near the close of the pre-electrical period in the records of street lighting. A new era was even then imminent; and within a time measurable by months, the advent of the Jablochkoff electric "candles" was to throw the old-fashioned street lanterns, whether catoptric or plain, into the shade of public disfavour, and the question of the amount of lighting really needed for streets under various circumstances was to be brought forward in a new way, and dealt with in a new spirit.

The study of open-air lighting upon the basis of quantity was an outcome of the introduction of electric lighting. The only kind of the latter known at first was the arc, which could not be depended upon to work, even in the spasmodic fashion which marked its early performances, at a lower intensity than from 300 to 500 candle power. Electric lamps of this power were erected, with startling effect, in streets which had never known anything better than the 5-foot gas-lamp. For the time, the good of street lamps as beacons, according to the principles just discussed, was altogether lost sight of; and perpetual illumination of the streets on the standard of the brightest moonlight, or the most lavish display of the arc lamp, was assumed to be the need of the hour.

In 1878—the next year to that which witnessed the quiet discussion of Mr. Brett's old-world paper—Mr. Corbet Woodall, as President of the British Association of Gas Managers, had to deal with electricity and street lighting in an altogether novel fashion. He noted the formation of the Société Générale d'Electricité, with the object of introducing electric lighting and exploiting what he called "the beautiful invention of M. Jablochkoff." Mr. Woodall went on to say that, in the various localities where the Jablochkoff light was used, "the total light provided is vastly in excess of what was obtained from the gas formerly used; and the effect is naturally so much better. Especially in the streets, we will all agree that more light would not be thrown away, even in London. In some large open spaces—such, for instance, as the Place de l'Opéra, where the lamps must needs be far apart, the electric light has a decided advantage over gas as usually burnt, because it more thoroughly illuminates the broad spaces between lamp and lamp. But this is a very small matter, and one that, if raised by the street authorities, and accompanied by a proffer to pay for more light, could probably be met." It is worth observing that no such demand was ever heard of before the electricians had forced the matter on by their unmanageably powerful lamps. The curious may speculate as to what would have been the consequence if the electric light had been available in 1878, as it is now, of all degrees of intensity. As it was, however, Jablochkoff candles were the only practical expression of electric lighting for street use; and they compelled the question of comparison between electricity and gas for this purpose to be stated upon the higher scale of brightness which they had introduced.

Mr. Woodall went into the matter of comparative illumination by gas and electricity; his remarks being prompted by the desire to allay that now historical "scare" which happened during his year of presidential office. They are worth reading in full as they appear in the printed Transactions of the British Association of Gas Managers for 1878; but they are cited here as being among the very earliest proofs extant of the growing recognition by gas engineers, at this epoch, of the need for the study of lighting effects. What Mr. Woodall talked about as President of the British Association of Gas Managers, moreover, he was shortly afterwards to deal with practically, in his capacity of Engineer to the Phœnix Gas Company.

(*To be continued.*)

The "Mechanical World" Pocket Diary and Year Book for 1892 has been issued. It contains, in a compact form, a useful collection of rules and notes serviceable to engineers, mechanics and draughtsmen.

Society of Arts.—The 138th session of this Society was opened last Wednesday with an address by the Chairman of the Council (Sir R. E. Webster, Q.C., M.P.). At its conclusion, he distributed the medals awarded by the Council for papers read during the past session; one being given to Professor W. Robinson, for his paper on "The Use of Petroleum in Prime Motors," which has been noticed in our columns.

TECHNICAL RECORD.

AMERICAN GASLIGHT ASSOCIATION.

In the JOURNAL a fortnight ago, we gave a brief indication of the nature of the proceedings at the nineteenth annual meeting of this Association, held in the Scottish Rite Hall, New York, on the 21st and 22nd ult.; and we to-day commence our usual abstract report.

Captain W. H. White, the Vice-President, occupied the chair, in the absence of the President through illness. An unusually long list of applicants for membership was first presented. It comprised 41 active and 10 associate members, and was unanimously accepted. The Secretary's report showed a membership of 374. A Committee appointed to consider the advisability of concerted action on the part of gas companies with regard to the Chicago Exhibition, reported that the whole of the exhibition was to be lighted by electricity, and that there was no disposition on the part of the Commissioners to permit an extended or extensive display of gas as an illuminant, although they were going to introduce one of the most magnificent electric lighting plants in the world. After other preliminary business, the Chairman delivered a short address.

The first paper was presented by Mr. C. H. Nettleton. It dealt with the subject of "Leakage," and appears below. Discussion having been invited, Mr. J. F. Scriver observed that nothing was said in the paper about condensation. In cold climates this was one of the principal causes of unaccounted-for gas; and he would like to hear if Mr. Nettleton was troubled that way. Mr. T. Littlehales referred to the leakage that takes place through the valves of large sized meters during the night, when only one or two burners are in use. He lately examined a 50-light meter, and found it correct at full capacity; but with only three lights, it did not register at all, and with five lights in use it was 75 per cent. slow. Mr. W. H. Pearson had been under the impression that the loss referred to by Mr. Littlehales was considerable; but about a year ago he tested 400 or 500 meters *in situ* with a single light going, and did not find half-a-dozen that would not register. Mr. G. B. Neal, of Charlestown, observed that he was troubled with a high leakage account, although he took every possible pains to reduce it. The average of the meters tested were nearly correct. In one quarter the leakage diminished some 33 per cent., without any special means being applied; and he was unable to account for it. He did not consider there was much loss due to differences in temperature at the station meter and at the consumer's meter respectively. Shrinkage of bulk from a reduction of temperature was a different thing from condensation, which he took to mean the actual deposition of a part of the gas in a liquid form. This was what he suffered from, and would like to hear of a remedy. Mr. A. S. Miller said that the gas left the station meter practically saturated with water vapour; and therefore the contraction in volume due to a reduction of temperature would not only include shrinkage, but also the loss due to the deposition of water in the liquid form. If gas was measured through the station meter, then reduced 10° in temperature, and restored to the original temperature just before being passed through the consumer's meter, it would not measure out to its original volume. When a station meter was working against a heavy holder pressure, the water might show at the proper level in the gauge, and yet be low inside. A quantity of water would have been blown out by the high pressure, causing the meter to register slow. Mr. Boardman considered that the alteration in volume due to the separation of watery vapour would be a mere trifle, but he remarked that the difference in pressure at the station meter and at the consumer's meter might affect the question. Mr. A. G. Glasgow said it could be easily demonstrated that gas saturated with aqueous vapour occupied a larger volume than when desiccated. It had been impressed upon them in the paper that the earth should be well rammed *under* the pipes; but he failed to see the necessity for cutting it out under the pipes in the first place, and preferred to carefully level the bottom of the trench, and lay the pipe on virgin soil, except at the joints. Mr. W. B. Fodell said that in gravelly soil the mains oxidized rapidly, while in loamy soil they remained good. The difference in temperature of the gas at the station meter and at the extreme ends of his district was not worth mentioning. Mr. James Somerville expressed surprise at Mr. Nettleton being able to reduce his leakage to 2·7 per cent., and thought that was practically no leakage at all. He remembered that Mr. George Anderson, of London, once had occasion to measure the gas just outside the works through a second station meter, and found it had lost 5 per cent. So when he had brought his leakage down to 7 per cent., he thought he was doing well. There always would be some leakage, so he said he could not understand this 2·7 per cent., and advised those who could not approach that figure not to be discouraged. Mr. W. R. Addicks produced some reports of the testing department of the Boston Gas Company for the last 6 months. They had 140 miles of mains. The leakage in a district of about 32 miles was 357 cubic feet per hour, as shown by 237 tests; and they had already reduced that to 63 feet per hour. Assuming that the leakage throughout the entire area was in the same proportion, they had an annual loss of 20 million feet, of which more than three-fourths could be stopped. The testing operations had resulted in the discovery of some half-a-dozen leaks for every one reported at the office in the usual way. The meters had also been systematically tested. During the three months ended Sept. 30 last, 873 meters were examined, of which 89 were fast and 235 slow. For comparative purposes, each meter was multiplied by the nominal number of lights, and again by the percentage of error. From these figures he had been able to calculate that the loss by slow registration in Boston was 24 million feet per annum. As bearing on the question of condensation, he instanced the Roxbury Gas Company. When they made their own gas, the leakage was 8 per cent. But they discontinued the manufacture, and purchased gas which was supplied from a distance of 3 miles. The leakage then fell to 2 per cent. The tests showed that a mile of main only lost 1 to 5 cubic feet per hour. Mr. F. H. Shelton drew attention to the fact that the liquid generally pumped from the syphons was a mere trifle—too little to have much effect on the question of the loss of volume. At Birmingham they had only a few public lamps, and but little heavy traffic in the streets. Mr. Emerson M'Millin said that there was not so much variation between the quantities of gas accounted for per ton of coal at different works, as in the make, and the quantity accounted for was the more important matter. Mr. Addicks, replying to questions, said that at Boston, out of 1073 leakages found and stopped in six months, 699 were defective lead joints, 172 bad cement joints, 59 broken mains, 97 leaky services, 31 leaky lamp services and 14 sundry causes. The Company used to confine themselves to cement joints; but now they used both, one lead joint to two cement, or, in good ground, one lead joint per 100 feet. In the latter case they occasionally had broken mains. Fifty-nine cases were mentioned; and they all occurred in the winter. He did not believe in all lead joints; but, of course, the cement joint was not so strong, and therefore not so suitable in loose or made ground. There was a system of valves all over the district which occasionally proved of great use in case of conflagrations, &c.; and he took care to have all these kept in good working order. There were 2000 valves in all; but he doubted whether anyone would now recommend so many, on account of the expense.

Mr. Nettleton, replying to the discussion, said that it was his rule to add 2 per cent. to the weight of coal actually weighed in the retort-house, as an allowance for shrinkage and overweight. He had arrived at the figure of 2 per cent. from his experience. Difference of temperature had more to do with loss of gas, he thought, than the actual condensation of part of it as liquid. In his case very little liquid was deposited in the mains. At Birmingham all large meters were tested once a year, and ordinary ones every three years; and he had frequently met with leakage in the valves of large meters as alluded to by Mr. Littlehales. He had adopted his present system of testing mains as an improvement on the usual plan of isolating a line of main, and then passing gas through a meter into it, on account of the difficulty of keeping all main-taps closed during the test. He examined the mains once a year, or oftener if desirable. No correction was made for temperature at the station meter. It was quite correct that he was able to make 600 to 800 test holes at a cost of about £3. The cost was lower than one would suppose. He believed his lower leakage account was due to getting the mains tight and the meter right; and he quite agreed that the quantity of gas accounted for per ton was the true test.

(*To be continued.*)

LEAKAGE.

A Paper read by Mr. C. H. Nettleton, of Birmingham (Conn.), at the Annual Meeting of the American Gaslight Association.

In presenting a paper on "Leakage," I do not expect to say anything startling, or to add very much to the stock of knowledge already possessed by the members of this Association. The cost of gas is made up of so many items, that it is perhaps difficult to say which is the most important. The coal, the oil, the labour, the leakage, the office—all are important; and care and attention should be given to each, but to no one item to the neglect of the others. There used to be a saying current among gas men twenty years ago, which I have not heard so frequently in recent years, and that was that "the money was made or lost in the retort-house." But times have changed; and now, in many companies, a larger part of the cost of gas is outside the gas-woks yard, and distribution is as important as, and in some cases more important than, manufacture. In calling your attention to one of the items of distribution—"leakage"—I am sure you will all agree that it is of sufficient importance to receive a portion of every gas manager's time.

By the term "leakage," I mean the difference between the gas registered at the station meter and the amount for which we make out gas bills, *plus* the quantity consumed in the works, offices, &c.—in other words, the unaccounted-for gas. The causes for the difference between the gas made and that registered by the consumers' meters are numerous; and some of them I propose to consider at length.

Temperature.—One of these causes, over which we can have but little control, and to which I think but slight attention has been paid, is the difference in temperature at which the gas is

measured at the works and at the consumer's meter. A friend of mine tested the temperature of the gas for a year in New York City, at the station meter of the works in his charge and at the meter in his own house, and the average difference was nearly 16°. In this case, the meter was in the cellar of the house. Allowing for meters kept in warmer places—such as factories, stores, &c.—it is probably safe to say that in this latitude the difference in the temperature of gas when made and when sold is not far from 10°; and as every 480 cubic feet of gas expand or contract about a foot for each increase or decrease of 1° in the thermometer, it follows that for the estimated 10° the contraction is 2 per cent. Of our apparent loss of 5 or 10 per cent., therefore, about two parts are beyond our control.

Leaks in Mains.—The main source of loss is probably leaks in mains and services. Thanks to the energy and ability of the men who make our pipes to-day, we have—whether employing cast iron, wrought iron, or steel—a uniformly good pipe, in using which with reasonable care good joints can easily be made. The younger men in the business will never know, unless they happen to use some ancient "special," the annoyance and bad language produced years ago by the spigot end of some fitting being too large for the socket of some pipe of the same nominal size, though both pipe and special, perhaps, came from the same foundry; or when in regular socket and spigot pipe the space for a joint was only $\frac{1}{8}$ inch in width. With such pipe it was very hard to make good joints, and consequently difficult to keep down the leakage.

I am unable to speak from personal knowledge of the use of wrought iron or steel pipe as mains; but those who have used that kind speak highly of it, particularly in connection with its freedom from leaks. The Company with which I am connected have nothing but spigot and socket cast-iron mains; and as they in this section of the country are used almost exclusively, I propose to confine my remarks to them alone. Owing to the heavy water pressure put upon all cast-iron pipes at the foundry where they are manufactured, the mains, when first purchased, are almost certain to be without cracks or holes, and when laid and the joints well made with either a good soft lead or Roman or Portland cement, one is reasonably sure of having a tight pipe before the trench is filled.

With regard to the material used in making joints, personally I prefer those made of cement, on the score of greatly reduced cost, and less liability to leak. A personal experience will best illustrate my faith in these joints. In a severe winter several years ago, the frost had got round a 6-inch gas-pipe in a certain street, and a large leak was reported in the neighbourhood. On digging up the pipe, it was found to have pulled apart $\frac{3}{8}$ inch where it had been tapped for a $\frac{3}{4}$-inch pipe, while a cement spigot and socket joint less than 3 feet away was intact. I think the chances are that with a lead joint the latter would have drawn, and a leak been started; but either lead or cement, with well-driven gaskets, makes a first-class joint.

The filling of the trench as far as the top of the pipe is a very important matter; and too much care cannot be taken up to that point. Crooked rammers should be used to pack the dirt firmly under the pipe, so as to give it as solid a foundation as possible. But, in doing this, care is needed, particularly with small pipes, to see that the earth is not rammed too vigorously, thus raising the pipe out of line and making the first start toward leaky joints. I desire to emphasize this point, as I believe as much, or even more, depends on the manner in which the ditch is filled as on the way the joints are made. Another personal experience may illustrate this. About twelve years ago, I had occasion to lay 8000 feet of 8-inch pipe. It was "rushed" through, and the cost per foot was satisfactorily small. The gas was turned on, and tested by means of a meter and valve. To my surprise and mortification, the gas was passing the meter rapidly, although not a consumer was on the main. Some of the leaks were soon found and stopped; but the pipe could not be made satisfactorily tight at once. Afterwards I ascertained that, in the hurry of getting in so many lengths of pipe per day, in certain sections the soil had not been properly rammed under the pipe. For nearly three years after it was laid, the main was a source of great annoyance and expense; but finally, with the ramming each length received when a leak was repaired, the trouble disappeared, and to-day it is as tight as any other length of pipe under my control. But while the trouble lasted, I believe it is no exaggeration to say that more than 500 leaks were repaired on that line of pipe. Since that time my attention in laying pipes has been given principally to packing the earth under and around them.

Kind of Soil.—The quantity of leakage depends to a considerable extent on the character of the soil surrounding the pipes. Given a sandy or gravel soil, and the passage of the gas from the pipe through a hole or a cracked joint is hindered very little by the surrounding earth. Loam lessens the leak materially; and stiff wet clay makes the pipes tight—holes and cracks to the contrary notwithstanding. In a certain city in which the gas-pipes are surrounded by mud, through which the gas cannot be forced by the ordinary pressure, I was told that the leakage was absolutely *nil*, except the gas lost in putting in services, laying new mains, &c.

In this connection, it may not be out of place to describe the method I follow in searching for leaks. The gang is made up of a foreman and either eight or ten men. The foreman, from his book containing the location of pipes, lays out the line, indicating it in any convenient manner. Along this line, when on unpaved streets, a man makes holes every six or eight feet through the crust of the road with some light pointed iron bar—generally a piece of 1-inch pipe with a steel point at one end. Following him come six or eight men in couples, each with an 8-lb. striking-hammer, and each couple with a steel bar about 3 ft. 6 in. long, having one end drawn out to a long, sharp tapering point. Into the shallow holes made by the man in advance, these steel bars are driven; each bar being struck by two hammers. When driven from 2 to 3 feet (the distance varying with the known depth of the pipe), the bar is hammered sideways, and then is easily withdrawn by hand. The two men take their bar, and go forward immediately to drive another hole. Following these is another man, whose sole business is to smell at the openings made by the bars, and then fill them with loose earth; reporting all leaks to the foreman. On paved streets, the same bar is used for a short distance to separate the paving blocks; and then a smaller one is driven down to the main. So much difficulty was found, however, in withdrawing the bars on the paved streets that, to save time, a tool was made, which, while crude, works well. A heavy bar, with jaws on one end, is used as a lever; a piece of hard wood, cut on its edge into steps (the latter shod with iron plates) is used as a fulcrum; and the bar prised out. This simple device nearly doubled the quantity of work that could be done on paved streets with a given amount of labour, as compared with withdrawing the bars by hand. The above system is the result of many experiments through a series of years; and while it may not answer in all places, with the soil in my neighbourhood, which is largely sand and gravel, it works very well.

Services.—With leaks in services I have had very little experience; but I am told that in older companies than mine, and in those where the soil rusts wrought iron quickly, this is a large source of loss. It is said that this destruction can be prevented by coating the pipe with one or more preparations; but of that I cannot speak of my own knowledge. Certainly, if troubled from this source, I would try to see that the services were so coated that little or no rust would form.

Consumers' Meters.—Another cause of unaccounted-for gas is the errors in consumers' meters, for which I think the only remedy is periodical testing. If a Company do not test their meters for years, some of them are bound to get out of order. The bellows gradually lose their oil, do not expand to their full capacity, and the meters run fast, or the bellows are cracked, the valves or their seats wear unevenly, and the meter runs slow. The fast meters, when they become fast enough, are sure to be heard of by reason of complaints from the consumers. Then they are brought in, tested, and correct meters substituted. But the slow meters are not generally heard of until they fail entirely to register. In this way, and for these reasons, the companies failing to test their meters will in time have a large majority of them running slow; and I am confident, after testing all my meters a number of times, and knowing how many are fast and how many slow, even when repaired every three or four years, that it is only a question of a few years before 7 per cent., or even more, of all the gas sent out would become unaccounted for by reason of slow meters. This is one reason, but not the only one, why it pays to test meters periodically.

Station Meters.—Another cause of loss is an incorrect station meter. How general this is I am unable to say; but more than once, when hearing some wonderful tale of big yields per pound of coal, I have wondered if the station meter on which

Year Ending.	Gas Sent Out.	Gas Unaccounted For.	Percentage of Total Outsend.	Miles of Pipes. (Approximate.)	Gas Sent Out per Mile per Year.	Gas Lost per Mile per Year.	Total Cost of Searching and Stopping Leaks.	Cost per Mile per Year.	Yield per Pound of Coal.
	Cubic Feet.	Cubic Feet.			Cubic Feet.	Cubic Feet.			Cubic Feet.
April 1, 1882. . .	20,503,040	1,879,082	9·1	9·4	2,181,174	199,902	$862 23	$91 72	4·72
,, 1883. . .	24,331,210	2,007,518	8·2	10·6	2,295,397	189,388	273 21	25 77	4·90
,, 1884. . .	27,770,260	2,659,308	9·5	11·8	2,353,412	225,365	285 64	24 21	4·87
,, 1885. . .	26,471,990	2,216,838	8·3	12·2	2,169,835	181,706	481 20	39 36	4·93
,, 1886. . .	28,332,044	1,496,123	5·3	14·3	1,981,262	104,624	395 63	27 66	4·92
,, 1887. . .	30,107,386	1,539,296	5·1	14·8	2,034,350	104,006	609 79	41 20	4·74
, 1888. . .	33,268,912	1,533,448	4·6	15·3	2,174,439	100,225	22 74	1 48	4·91
, 1889. . .	34,851,118	1,859,938	5·3	15·8	2,205,767	117,718	531 04	33 61	4·89
1890. .	38,910,268	1,679,948	4·3	16·7	2,329,956	100,595	243 42	14 57	4·85
, 1891. . .	43,004,890	1,154,021	2·7	16·9	2,544,490	68,285	370 61	21 93	4·77

these results were based was correct. I have heard it stated that very high yields and very large leakage were quite apt to go together. But in this matter, as in many others, it is easy to deceive oneself; and tests should be made occasionally to demonstrate the fact that the meter is approximately correct.

The table on the preceding page has been prepared with care, and gives the results obtained at the works in my charge for the past ten years.

In the fourth column (the miles of pipe), I regret to say that the figures for the first few years are not absolutely accurate; but the errors I believe to be slight. The figures for the last four years are correct. The sixth column (the loss per mile of pipe per year) probably expresses leakage in the fairest way possible for the purpose of comparison with other works; and yet, given works with a consumption of 10 million cubic feet per mile, the loss due to difference in the temperature at which the gas is measured at the works and in the consumers' houses would probably be nearly 200,000 cubic feet per mile. For the average-sized works, however, under 100 millions per annum, and sending out between 1½ and 3 millions per mile of pipe per year, I suggest that no fairer basis of comparison can be made than the loss per mile.

It was suggested a few years since that the size of pipe ought to be considered—that on a 12-inch pipe the chances of a leak were just double those for a 6-inch, owing to the greater area of pipe and joint. But all smaller works will average about the same sized pipes; and to figure everything to a basis of (say) 4-inch pipe is a refinement which, in my judgment, is uncalled for. I am quite well satisfied that for small works 100,000 to 150,000 cubic feet per mile per year should be considered a reasonable amount of leakage; and, unless the circumstances were exceptional, a manager should not rest satisfied until this figure is reached. The seventh and eighth columns of the table give the total cost and the cost per mile respectively of searching for and stopping leaks. These columns are added to give general interest to the table, and in the hope that discussion will bring out the fact that the amounts stated are above or below the average cost in other places. I desire to call your attention to the fact that in the year ending April 1, 1888, only $22 was charged to leakage; but in the year following quite a large amount was spent, and yet the leakage increased—showing the lack of attention in the previous year. The last column is given so that it cannot be suggested that, if the yield per pound of coal had been given, the table might have assumed a different appearance. It is but fair to state that these yields are reached after adding 2 per cent. to the weight of coal carbonized. Attention is called to the lower yield for the year ending April 1, 1891, and to the small leakage in the same year. I think it is entirely probable that, if the yield for the last year had been larger, the unaccounted-for gas would not have been so small as reported.

In closing this paper, I venture to express the opinion that, like many lines of work, it requires only patience and perseverance to make a success with the leakage problem. Regular attention, the same as we give to our manufacturing operations, through a series of years, will certainly bring the desired result. But, when once reduced, it will not do to assume that the leakage will remain small. The laws of Nature are constantly working in a way which must produce leaks sooner or later; and if no attention be paid to mains for two or three years, the leakage will surely increase, no matter how small it may be at the commencement.

The Resignation of the Town Clerk of Leeds.—A special meeting of the Leeds Town Council was held yesterday week to consider the proposed resignation of the Town Clerk (Sir G. W. Morrison) on account of ill-health; and, after two letters had been read from his medical adviser, it was agreed that Sir George's resignation should not be accepted, but that he should be granted three months' leave of absence.

Prizes by the Dutch Academy of Sciences.—The following are among the subjects which have been proposed by the Dutch Academy of Sciences, at Haarlem, for prizes which they offer to competition: The molecular theory of internal friction of gases (and, if possible, of liquids) departing from Boyle's law. The oxidation of ammoniacal salts in the ground, and their transformation into nitrates. Researches on the organism concerned in the production of marsh gas, or the conditions in which the gas is formed, if life has only an indirect influence on the phenomenon. The prize offered in each case is a gold medal, or a sum of 150 florins. The papers may be in English; and the time for their delivery is Jan. 1, 1893.

Utilization of Marsh Gas.—According to the *Buenos Ayres Standard*, two Engineers—MM. Medici and Moneta—have requested the Argentine Government to grant them privileges for the extraction of marsh gas from the islands in the delta of the Paraná. An analysis made by Dr. Arata gives the following proportion of elements: Marsh gas, 75·90 per cent.; oxygen, 4·20 per cent.; carbonic acid, 4·10 per cent.; nitrogen, 15·80 per cent. The proportions of oxygen and nitrogen are evidently atmospheric. The Board of Public Works have, it is stated, reported favourably on the request, provided the Government interfere in the tariffs, and the concessionnaires supply the Government offices with light and motive power free of charge.

REGISTER OF PATENTS.

Producing Light by Incandescence.—Heskin, T., of Ashton-on-Ribble, Lancs. No. 16,821; Oct. 22, 1890. [8d.]

These improvements relate to the production of light by heating to incandescence magnesia or other refractory earthy substances, by means of Bunsen or other gas-burners, and of automatically supplying and renewing such substances.

Hitherto, the patentee remarks, the appliances for producing light by this method have consisted of a mantle or hood formed of magnesia network; but owing to the delicate and fragile nature of such appliances, they have been liable to be fractured, and so rendered useless. Moreover it has been found that the light-giving properties of these appliances rapidly deteriorate, and they have to be frequently renewed. The principal feature of the present invention, therefore, consists in the preparation of a mixture of certain chemical substances which when suitably applied to the flame of the burner evolves a continuous supply of refractory earth. The mixture is prepared by dissolving 1 part by weight of chloride of magnesia in water, and adding thereto 2 parts of glycerine. The mixture is then gently heated until it has attained the consistence of syrup, after which a sufficient quantity of magnesia is added to make it slightly pasty.

The appliance necessary for the purpose of producing light by incandescence consists of a metallic cylinder (preferably of platinum) fixed in the central air-way of an Argand Bunsen burner, and filled with the mixture prepared as described. The external diameter of the cylinder is about ¼ inch less than the interior of the flame; and it extends to a height of about 2 inches above the flame. The exterior of the cylinder is fitted with a number of short tubes, about one-sixteenth inch in diameter, and placed the same distance apart. The tubes are composed preferably of platinum foil, fixed at right angles to the cylinder; and they communicate with its interior and project to such a distance as to almost, but not actually, touch the flame of the burner. When the burner is lighted, the heat of the flame melts the mixture at the end of each tube and decomposes it. During this decomposition the gaseous products of the glycerine on being set free cause the mixture at the end of each tube to swell out and immerse itself in the body of the flame, where the decomposition is completed—a residue of magnesia being left adhering to the end of each tube. If, however, the ends of the tubes actually touch the flame, the decomposition of the mixture takes place too rapidly; and the magnesia is left in an extremely light and porous form which is not so well adapted for illuminating purposes as the denser form.

So long as the tubes remain in the same position with respect to the flame, the supply of magnesia will be continued, until the whole of the mixture in the cylinder is exhausted. To prevent this continuous supply, the ends of the tubes are blocked up in the interior of the cylinder, by moving a slide simultaneously with the turning on of the gas. This cuts off the supply.

Manufacturing Combustible Gas for Heating, Lighting, and the Generation of Power.—Guyon, H., and Métais, L., of Paris. No. 18,360; Nov. 14, 1890. [8d.]

This invention relates to the manufacture of combustible gas by means of incandescent coke, such as is collected in ordinary retorts used in the distillation of coal or other carbonaceous or coal-containing substances for the purpose of producing illuminating gas.

Hitherto (say the patentees) incandescent coke resulting from the distillation of carbonaceous materials has been extinguished in the open air; but the present invention consists in effecting the extinction of the red-hot coke in a closed vessel by means of (1) steam during the first stage, and (2) water during the second stage of the process. Part of the steam first employed for partly extinguishing the incandescent coke decomposes; and, together with a portion of the carbon contained in the incandescent coke, it forms oxide of carbon and carbonic acid. Thus, during the first stage of the extinguishing operation, a gaseous mixture of hydrogen, oxide of carbon, carbonic acid, steam, and other gases or vapours is obtained. These various gaseous products, while very hot, serve for heating the water contained in a boiler, so as to transform the water into steam, which in its turn may be used in the next following operation of the same kind. The extinction of the red-hot coke is meantime continued in the second stage of the process. Water injected into the retort or closed chamber containing the coke, will partly become steam, and pass away in this condition into the boiler just mentioned, where it either assists the production of the amount of steam necessary for the next succeeding extinguishing operation or is directly taken advantage of as motive power. The coke thus extinguished by two successive operations, when quite cold, is discharged from the lower part of the retort, and disposed of in the same way as ordinary gas coke extinguished in the open air by the old methods, as it has lost none of its combustible properties in the process.

Instead, however, of removing the coke after extinction, with a view to its disposal as fuel, it may be left in the retort, and its temperature raised by injecting into the retort a blast of air which will blow it red again. It is then once more extinguished by steam, as in the first stage of the process described. Such alternate injection of air and steam may be kept up until the coke is entirely exhausted, when of course it is no longer fit for sale as fuel. This latter mode of utilizing ordinary gas-retort coke will be found convenient especially where the coke is of inferior quality.

Gas-Heated Bakers' Ovens.—Gilson, R. A., and Booer, W. J., of Union Street, Southwark. No. 19,030; Nov. 24, 1890. [8d.]

This invention refers to an oven with inserted plate and gas heater arranged in the corners at both sides of the working door, the flames of which, for the purpose of acquiring the most intense heat from above, graze the inserted plate on both sides. In order to bring the less heated parts equally, to the desired degree of warmth, if perhaps the heat of the different parts of the plate should be unequal, the space above the inserted plate is divided into several flues which can be regulated separately. It is thus possible to direct the hot burning gas, which acts as fuel, as required, either distributed equally over the plate or only over some parts of it. The burners employed are those described in patent No. 12,298 of 1886.

Gas-Engines.—Lobet, L., of Brussels. No. 19,791; Dec. 4, 1890. [6d.]

The distributing device of the engine which forms the subject of this invention comprises a cam upon which moves a roller attached to a rod fixed at its lower part to a stirrup which moves the valve for admitting the mixture to the discharge valve. Upon the rod is provided the axis of a pendulum which regulates the velocity of the engine. When the piston sucks, the cam presents to the roller a receding part; and the rod slides, and bears upon the admission valve so as to allow the mixture to pass. When the piston has arrived at the end of its stroke, the roller passes upon a concentric part of the cam until it encounters a nose-shaped part, which raises it together with the rod and stirrup. The latter then moves the discharge valve, and the products of the combustion which has taken place in the cylinder escape into the atmosphere. As the engine continues to rotate, the roller passes upon a concentric part of the cam, and is then at rest.

The pendulum is provided with a projection, which strikes against an arm when the rod rises to actuate the discharge valve; and this causes the pendulum to oscillate more or less strongly. As the suction takes place immediately after the discharge, the roller descends into a recessed part of the cam. The rod and pendulum likewise descend; and the former opens the valve for the passage of the mixture, and the latter the valve for the passage of the gas—if the oscillation has not been too strong and the pendulum arrives in time. If the engine operates too quickly, the thrust of the arm against the projection on the pendulum is stronger, and the oscillation greater; and when the rod descends again, the pendulum not having had time to move back towards the gas-valve, passes to one side instead of opening the valve. Only air is, therefore, introduced into the cylinder; and no motive power is produced. A spring, under more or less tension by an adjusting screw, enables the amplitude of the oscillations, and consequently the velocity of the engine, to be regulated.

Treating by the Claus Process Gases containing Sulphuretted Hydrogen, and Recovering Valuable Products therefrom.—Heaton, C. W., of Bedford Park. No. 21,217; Dec. 30, 1890. [8d.]

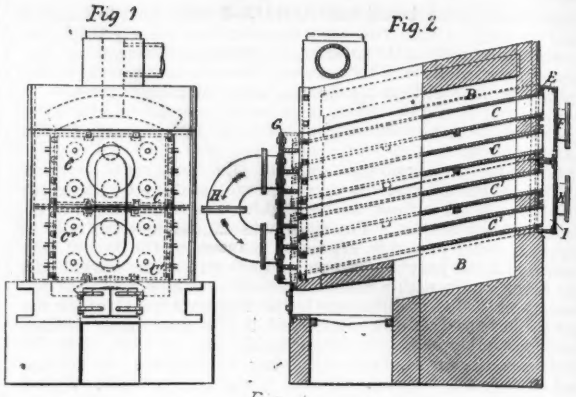
This invention has reference to improvements in the treatment by the Claus process of gases containing sulphuretted hydrogen; the object being to not only enable a large percentage of sulphur to be economically recovered, but at the same time to obviate the nuisance liable to result from the carrying on of the Claus sulphur-recovery process as usually practised. The patentee proposes that the gases containing sulphuretted hydrogen should be treated in a Claus kiln as usual, for effecting the separation of the sulphur—the sulphur vapour and gases to pass from the kiln, while a large proportion of the free sulphur is condensed and collected. Then the cooled gases, with their contained sulphur (free or combined), are mixed with air in quantity sufficient, or more than sufficient, to oxidize all the unoxidized sulphur, and convert into sulphurous acid and water the sulphuretted hydrogen that escaped from the sulphur-recovery apparatus. Then the mixed gases are passed into apparatus constructed with chambers charged with some substance that will cause the oxidation of sulphuretted hydrogen—as, for example, oxide or iron, to the action of which the gases are subjected as in the well-known Claus kiln. But as there may not be sufficient unoxidized sulphur or sulphuretted hydrogen to generate by oxidation a sufficient degree of heat to keep the contents of the chambers sufficiently hot, provision is made whereby additional heat can, when required, be applied to the chambers. Thus the free sulphur (if any), and the sulphuretted hydrogen, are oxidized even when present in small proportion.

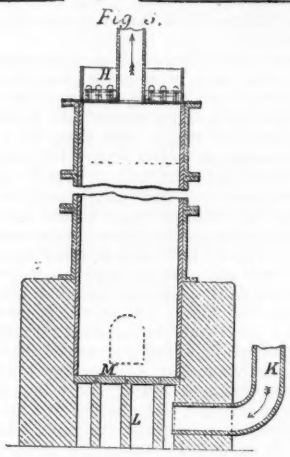
As will be evident, different plans can be adopted in carrying out the invention so long as the interior of the supplementary Claus kiln be kept at a temperature sufficient for its continuous action. Thus, for example, the supplementary kiln can be constructed in close proximity to a furnace, in which coke or other suitable fuel can be consumed; and the exit gases from the kiln may be discharged separately, or be allowed to mingle with the gases produced by the combustion of the fuel. Or in some cases it might be found convenient to arrange the supplementary kiln so as to be supplied with heat from the ordinary kiln, in which a great degree of heat is generated that heretofore has not usually been utilized. But the first of these arrangements will, the patentee believes, usually be found preferable.

Figs. 1 and 2 show, in front elevation and partly in side elevation and partly in section, apparatus such as that referred to as the supplementary Claus kiln. Fig. 3 is a vertical section (on a large scale) of a wash-tower.

In figs. 1 and 2, the furnace is shown with the combustion chamber B traversed by inclined tubes or chambers arranged in two series C and C^1. E is an end box, with connection F to a suitable cooling apparatus (such as a wash-tower), which in turn is in connection with the sulphur-depositing chambers of the ordinary Claus kiln. The upper ends of the inclined tubes or chambers are open to the box E. G is another end box with an internal horizontal partition, whereby it is divided into two compartments connected by a bent pipe H. The lower ends of the tubes or chambers C are open to the upper compartment; and those of the tubes C^1, to the lower compartment. I is an end box in communication by a pipe K with the wash-tower represented in fig. 3; or it might be with the first tower of a series. The upper end of the tubes or chambers C^1 are open to the end box I. The chambers C C^1 are nearly filled with pieces of oxide of iron, oxide of manganese, or other material suitable for the purpose already referred to, as will be readily understood by chemists.

By combustion of solid fuel in the furnace, sufficient external heat is supplied to give to the gases in the chambers C C^1 a suitable temperature—say, about from 600° to 800° Fahr., in order to convert the H_2S into SO_2 and H_2O. The gases escaping from the sulphur-depositing chambers of the Claus kiln ordinarily used in carrying out the Claus process—and which gases consist mainly of inert gases with small but varying quantities of H_2S or SO_2, but usually both (according to the manner in which the Claus process is worked)—are, according to this invention, first cooled; mixed with sufficient air to oxidize any H_2S they may contain; and then the mixture of gases and air is caused to pass through the supplementary Claus kiln—*i.e.*, through the packed chambers C C^1 in the example illustrated.





From this apparatus the gases pass to a tower, such as that represented in fig. 3, which is suitably packed. They enter the chamber I by the pipe K passing through the perforations in the false bottom M, and ascending through the material with which the tower is packed; whilst water from the distributor N trickles down. If the tower be packed with limestone, the wash liquor may be allowed to run away; but the SO_2 may be absorbed by carbonate of soda, or caustic soda, or any other alkaline liquid; and sulphites of soda or other bases will be thus produced that will be of commercial value. Exit gases containing sulphuretted hydrogen may, after admixture with sufficient air, be heated by external heat—such as that of a coke fire—and then be passed through a supplementary Claus kiln, which in this case need not be otherwise heated; or the exit gases may be mixed with hot air, and then passed into a supplementary Claus kiln.

APPLICATIONS FOR LETTERS PATENT.

18,806.—Boore, L., Diehl, J. F., Haas, J. E., and Faux, M. J., "Improved gas regulator or governor." Oct. 31.

18,843.—Ragot, G., "Improvements in and relating to the manufacture of gas-lamps." Oct. 31.

18,959.—Feldmann, A., "Improvements in distilling apparatus suitable for the treatment of ammoniacal liquors." Nov. 3.

19,058.—Koopman, E. B., "Improved means for lighting lamps." Nov. 4.

19,086.—M'Ghee, G., and Burt, P., "Improvements in and relating to gas motor engines." Nov. 5.

19,219.—Joseph, H. V., and Joseph, G. D., "Improvements in oil or gas heating stoves." Nov. 6.

19,226.—Collins, I. J., "An improvement in regenerative gas-lamps for railway carriages." Nov. 6.

19,255.—Wilton, G., "Improvements in and relating to the purification of coal gas, and the recovery of products from the distillation of coal." Nov. 7.

19,318.—Barron, A., "Improvements in or appertaining to gas-engines." Nov. 9.

19,407.—Ballard, T. W., "Improvements in gas-fires." Nov. 10.

19,485.—Johnson, J. Y., "An improved heating attachment for lamp or gas burners." A communication from R. S. Merrill. Nov. 10.

19,513.—Milward, G. N., "An improved gas-burning apparatus for purifying, illuminating, and heating purposes." Nov. 11.

19,517.—Fielding, J., "An improved method of starting gas-engines." Nov. 11.

19,641.—Springer, T. G., "Improvements in the manufacture of gas, and in apparatus to be used therein." Nov. 12.

19,650.—Pain, A. C., "A regulating attachment for gas-taps." Nov. 13.

19,680.—Webb, F. W., "An automatic ball-valve for gas reservoirs." Nov. 13.

19,736.—Roger, G., "An automatic fire or gas lighter." Nov. 14.

19,743.—Dover, H. W., "An improved method for safely and speedily making gas connections for stage lighting." Nov. 14.

19,747.—Dodd, J., "Improvements in steam-engines, which may be used in gas, water, hot-air, or other engines." Nov. 14.

The Gas Supply of Lisbon.—The two Lisbon Gas Companies have now amalgamated; the alliance having been sanctioned by the municipal authorities and the shareholders. The joint undertaking will also supply the electric light.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Mr. Herring on Oil Gas as an Enricher.

SIR,—Mr. Methven will, I trust, see his way to favour your readers with his reasons for the statement which is attributed to him in your report of the discussion upon the paper read by Mr. Herring at the recent meeting of the Southern Association, that double the value is to be obtained from oil of about ·8 specific gravity by carburetting water gas than by carbonizing it in the ordinary retort. It will be recollected that the tendency of previous discussions—notably that which took place at the meeting of the Incorporated Institution of Gas Engineers in May last—has been to leave somewhat in doubt the economy of carburetting water gas; and it would, I feel sure, be much appreciated by all who are interested in the subject, to learn the grounds upon which Mr. Methven has formed an opposite opinion. The most economical method of using oil for enriching purposes is a question of increasing importance; and Mr. Methven is in a position to contribute powerfully to its settlement.

Without offering any opinion as to the general practicability of carbonizing a mixture of coal and oil in an ordinary retort, it does seem to me a matter for surprise that there should be such a conflict of opinion as to the gain in illuminating power to be derived from this method of using the oil. Some carefully conducted experiments made under my direction with 56-lb. charges have shown that increased luminosity over coal alone, averaging about 5 per cent., may be expected from a mixture of 99½ per cent. of coal and ½ per cent. of Russian oil; the oil being poured over the coal in the scoop immediately before putting the latter into the retort. The cost of such enrichment works out at about 3s. 4d. per candle for material—taking the oil to be worth about 4d. per gallon. With a higher percentage of oil, the results have been less favourable.

I attach importance to experiments such as these, chiefly as indicating that we have in this oil a material that should be available for enriching purposes at a comparatively moderate cost. What we have to do is to find out how to apply them to the best advantage.

Birmingham, Nov. 21, 1891. CHAS. HUNT.

SIR,—In view of the importance of the subject dealt with, and the interest it is now awakening, Mr. Herring will perhaps permit me to draw his attention to seeming discrepancies in his paper, and to ask for further explanations.

Six gallons of oil used per ton of coal are said to produce an increased yield of 525 cubic feet, and at the same time to improve the illuminating value of the whole of the gas to the extent of 1½ candles. Thus the value in candle power obtained from the oil used is $\left[\frac{(525 \times 14\frac{1}{2}) + (11{,}025 \times 1\frac{1}{2})}{5}\right]$ 4808; or 801 candles per gallon. The corresponding value of a ton of coal is $\left(\frac{10{,}500 \times 14\frac{1}{2}}{5}\right)$ 29,925 candles; so that 37½ gallons of oil are equivalent in gas-producing power to a ton of coal. Now, if we assume the oil to cost 4d. per gallon delivered, and the *net* cost of coal—that is, after deducting the amount realized for residuals—to be 7s. 6d. per ton, then the cost of enriching his gas by 1½ candles works out $\left[\frac{\left(6 \times 4\text{d.}\right) - \left(\frac{7\text{s. }6\text{d.}}{20}\right)}{11}\right]$ to 1¾d. per 1000 cubic feet. If his oil costs more or less than 4d. per gallon, the cost of enrichment is correspondingly increased or diminished; while, according as coal costs more or less than the amount assumed, the cost of enrichment varies in inverse ratio.

Turning to the statements given in the paper of the actual cost of enrichment in different years with cannel and with oil respectively, the cost per 1000 cubic feet (at 10,000 cubic feet per ton) works out to only 1·1d. and 0·5d. respectively. Obviously, the oil is obtained at a marvellously cheap rate, or there is some explanation needed as to the figures. So much as to cost. Turn now to the quantity of gas obtained from the oil. This is given in one place as 87½ cubic feet per gallon; while in another, 55 gallons are said to produce 43,000 cubic feet—equal to 782 cubic feet per gallon. The latter I take to be a misprint; otherwise the obvious discrepancy must have been detected at the meeting. Perhaps candles are meant; the figures would then approximate very closely to those before mentioned. JOHN T. SHEARD.

Glasgow, Nov. 20, 1891.

A Lighting and Heating Company for Persia.—Under the title of the Compagnie Générale pour l'Éclairage et le Chauffage en Perse, a limited liability undertaking has been formed in Brussels, with a capital of 1,800,000 frs. (£72,000).

An Attack on the County Council.—At the inaugural meeting of the London Ratepayers' Defence League, which took place last Wednesday in the Guildhall, under the presidency of Sir J. Savory, the Earl of Wemyss (Chairman of the Executive Committee), referring to the London County Council, said this body was mainly established to keep the streets well paved and clean, and the drains in proper working order; but they wanted to get tramways, gas, water, and other undertakings into their hands. They were also fixing wages, and the hours of labour, seeking to annul contracts, and trying to force legislation which would change the principles and likewise the incidence of taxation. Mr. Alban Gibbs proposed the following resolution: "That this meeting is of opinion that the London County Council has failed to understand the nature of the duties, responsibilities, and powers entrusted to it by the Local Government Act, 1888; and, while neglecting to fulfil many obvious and important duties, has, by meddlesome interference with matters over which it has no jurisdiction, and by harassing different bodies and interests, acted in a manner detrimental to the best interests of the Metropolis." The motion was carried.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, Nov. 6.

(Before Lords Justices LINDLEY, BOWEN, *and* KAY.)

Wenham Company, Limited, v. Champion Gas-Lamp Company.

This was an appeal by the defendants against the judgment of Mr. Justice Vaughan Williams in an action brought by the plaintiffs against them for infringement of their lamp patent. The proceedings in the Lower Court were reported in the JOURNAL, Vol. LVII., pp. 901, 968.

Mr. MORTON DANIEL and Mr. C. E. JENKIN appeared for the appellants; the ATTORNEY-GENERAL (Sir R. E. Webster, Q.C., M.P.), Mr. ASTON, Q.C., Mr. MOULTON, Q.C., and Mr. LAWSON represented the respondents, the plaintiffs in the action.

Mr. DANIEL, in opening the case, stated that the usual issues in patent actions were raised here. In the first place, the defendants denied the alleged infringement; and, secondly, they contended that if, on the legal construction of the plaintiffs' specification, the defendants had infringed, the patent was invalid for anticipation, and further that it was invalid by reason of absence of subject-matter or for want of utility.

Lord Justice LINDLEY remarked that the two grounds were not synonymous.

Mr. DANIEL said that, at all events, the subject-matter of the patent was impugned. The Wenham Company possessed a large number of patents, amongst them the one in question, which was granted to Frank William Clark in July, 1888, and subsequently amended, for a form of lamp. [Models were produced to the Court, showing the construction of the rival lamps.] The patent comprised a central pipe for the admission of the gas, which was led down through another pipe to a ring burner below, having perforations, from which the flame sprang in a radiated form, and was burned within the glass globe. Separate perforations were provided in the lower part of the lamp for the entrance of the air, which, passing through holes within, flowed upwards into the lamp. [The learned Counsel explained the positions of the two entrances, and the subsequent passage of the air, gas, and products of combustion.] The air current passed from the perforations across the chamber at the bottom of the lamp, and then up a narrow passage between its walls; then through three other passages or tunnels; and it was again led downwards through another tube. It was then conveyed outside the gas-tube and inside the chimney, through perforations, to the burner. Provision was made for the escape of the heated products of combustion through a passage or chimney leading to the top of the lamp, and out into the open air. The utility of this arrangement of parts was that the entering air, in its passage through the lamp to the flame, was heated, as was also the gas on its way to the burner; resulting in a great advantage for illuminating purposes. One principal feature of the plaintiffs' invention, according to the specification, was that a portion of the entering air was led through perforations in a projecting piece in the lamp, downwards, inside the globe, to the burner, the practical effect of which was to provide a second cooling current to counteract the great heat which otherwise would be developed. Accordingly, the introduction of the second current of air prevented the probable constant cracking of the globe. [Plans were produced showing the course of the gas and air currents in the lamp.] Round the sides of the lamp was placed a ring, over the holes in which the air current passed, and was continued from them immediately above the reflector towards the centre of the lamp; it then went up through an annular space between the outside tube and another piece of tubular metal.

Lord Justice KAY: The two essential things are, that one of the air currents is heated before it reaches the flame to be fed with oxygen, and the other cooler current passes round the glass globe to prevent it cracking from the great heat generated in the lamp. Then the products of combustion pass up the chimney which is kept hot against the descending current of air.

Mr. DANIEL said two modifications of the patent had been introduced by the plaintiffs; the first of the amended specifications being dated in July, 1888.

Mr. ASTON: The original patent having been taking out in 1881.

Mr. DANIEL said that this was a specification primarily for a railway lamp; the cooling current of air being a salient feature. In that arrangement, a ring or circular burner was employed; the tube being perforated if desired—thus supplying heated air to the interior surface of the flame. The defendants were charged with infringing the modified construction shown in the drawings, which, among other things, indicated the three passages through which the heated air passed across the chimney, the method of supplying the heated air to the inner surface of the flame, and the use of the continued perforations. The learned Counsel then called the attention of the Court in detail to the construction of the defendants' lamp, and stated that a point would arise upon the sense in which the word "inner" as applied to the surface of the flame, to which the heated air passed, was used in the specification. No doubt it went either to the inner or to the upper surface. [Samples of the burners used in the lamps were here produced.]

Lord Justice KAY: I see that a small portion of the gas comes out from the burner in a radiated form.

Mr. DANIEL said the air was brought down on the top of it; then the heated products of combustion escaped upwards outside, and parallel with the gas-pipe, and also outside the tube or chamber which brought the gas to the burner. In this respect the two lamps were identical.

Lord Justice LINDLEY: We understand that; now tell us what are the differences between yours and theirs.

Mr. DANIEL said they were differences of detail which would necessitate particular reference to the specifications.

Lord Justice BOWEN: This is a combination. Do you dispute the novelty of it?

Mr. ASTON said it was disputed.

Mr. DANIEL said the main difference was in the burner. In Clark's patent, the burner had a very large diameter relatively to the bottom of the tube; while in the defendants' burner the diameter was very small. In fact, the burners, which were the essential feature of the combination, were entirely different.

Lord Justice KAY: The actual difference is that your burner throws the flame out, and theirs throws it across.

Lord Justice LINDLEY: Supposing you had followed the patent in all other respects, can you say you have not infringed on account of that difference?

Mr. DANIEL said the difference between the burners was, in the result, very much as the Court had just pointed out. The difference in size of the plaintiffs' burner would cause the gas when lit to spread up outside the chimney.

Lord Justice KAY: Looking at their burner, it is plain that, though the air coming down impinged first upon the upper side of the burner, it is thrown on the inner side of the flame. In yours, it comes more directly on the inner side of the flame; but that small difference surely would not show there was no infringement.

Mr. DANIEL said that the heating portion of the lamp was common to both combinations.

Lord Justice KAY: And you say that, if you do not follow the whole of the plaintiffs' combination, you are not infringing?

Mr. DANIEL said not if there was a substantial difference. The main anticipation of the plaintiffs' patent which was relied upon was Siemens's burner, as described by drawings which had appeared in the JOURNAL. In that burner the gas passed up the centre of the tube. The air entered at the side, passed upwards to the flame, and issued from the burners; then the products of combustion were led downwards to a tube, through which they escaped to the air—the result being to heat both the gas and air on their passage to the burners. It was not denied that every element of the plaintiffs' patent was present in that invention, except as to the second or cooling current, and the air being brought to the inner side of the burner. There were other anticipations relied upon.

Lord Justice LINDLEY: In Siemens's burner the air is brought to the inner side, and comes out underneath the plate in which the gas-jets are placed.

Mr. DANIEL proceeded to read the evidence explanatory of the construction of the plaintiffs' and defendants' lamps, which it was stated resembled each other in globes, reflectors, tops, arrangements for the entry and exit of air, and for the escape of the products of combustion. All these features were common to lamps of this description. He contended that the plaintiffs must show their claim to something beyond the arrangements for the two currents of air, to make their combination patent valid. Sir F. Bramwell, in his evidence, had stated that the large wide chamber below in the defendants' lamp was equivalent to the narrow annular chamber and narrow passage in Clark's patent; but this was not really so, for there were important differences in the proportion of the parts.

Lord Justice LINDLEY: Do you assert that you have not in yours a series of concentric tubes?

Mr. DANIEL replied that he was afraid he could not deny that they were concentric.

Lord Justice KAY: They are not exactly parallel, but more like the mouth of a post-horn. Still they are tubes.

Mr. DANIEL said the defendants' case was that there was a difference in shape and proportion; that they had not, if the plaintiffs' patent was merely for a combination, that exact combination, and therefore were not infringing. These were all questions of degree; and the plaintiffs' claim must be limited to their particular combination, while the defendants' was not at all the same thing. The plaintiffs alleged that their second cooling current of air was an improvement on Siemens's patent, and that this was the novelty in their lamp.

Lord Justice BOWEN: It really comes to this: You say you have made a combination which is a variety; but still, having taken the substance of their combination (depending, of course, upon what that substance is), you would have infringed. It does not follow that, because of all the defendants' and plaintiffs' varieties, the defendants have not infringed.

Mr. DANIEL admitted that, apart from the construction of the specification, this was so.

Lord Justice BOWEN: The real point of the case is whether, taking Siemens's burner as the common source or origin, the defendants' burner has distinctive peculiarities beyond those which distinguish the plaintiffs' from Siemens's.

Mr. DANIEL acknowledged that this was the weight of the case against the defendants.

Lord Justice BOWEN: If the two combinations are the same, I do not see that you displace, by any number of variations, the case of infringement alleged.

Mr. DANIEL thought this depended upon the wording of the claims in the specification; and to these he proceeded to call attention.

Lord Justice KAY: In Siemens's burner, the air is represented as coming quite below the flame.

Mr. DANIEL said the air was applied to the upper surface of the flame. Clark had made claim, as a subordinate integer, for causing the air to go through the chimney on its passage to the flame; and this feature had been directly anticipated. Then another substantial difference existed between the plaintiffs' and defendants' combinations in regard to the form of the burner.

Lord Justice KAY: If you take the essential part, with mechanical equivalents or leaving out unessential parts, is not that, as Lord Cairns said, in the horse-clipper case, taking the pith and marrow of the invention? Are not the two things really the same?

Mr. DANIEL repeated that there were substantial differences. The plaintiffs, in fact, did not now use the burner described in their specification, but had adopted the same burner as the defendants, with the result of getting an entirely horizontal flame. A considerable improvement in these lamps had been introduced by the use of the defendants' smaller burner.

Mr. ASTON said the plaintiffs had used it long before.

Mr. DANIEL contended that the defendants had not infringed, upon the true construction of the plaintiffs' specifications and drawings.

Lord Justice KAY pointed out that it had never been the practice of the Court to read the language of a patent with too great strictness for the purpose of destroying it.

Mr. DANIEL proceeded to refer to several previously decided cases, as authorities in support of his contention that in such circumstances a patent could not be maintained, and could not be said to have been infringed. He then asked special leave to put in evidence on the appeal, as to anticipations—Young's specification of 1854, and another of Clark himself, dated 1863.

Lord Justice LINDLEY: You must explain how it is you ask for this now. You do not get special leave on appeal simply by asking for it.

Lord Justice BOWEN: This may involve a new trial. Do you put it upon the ground of surprise?

Mr. DANIEL said upon the ground that the defendants were surprised at the trial by the evidence then given, that the essential and meritorious feature of novelty in the plaintiffs' patent was the combination for producing two independent currents of air in the plaintiffs' lamp; there being no reference thereto in their specifications, nor anything from which the defendants could have foreseen or anticipated that the plaintiffs would have set up such a point upon the ground of novelty. These were the two anticipations now relied on.

Mr. ASTON took the objection that the leave asked should not be granted at the present stage. It was not shown that defendants had obtained knowledge as to the plaintiffs' case which they had not, or might not have acquired, with due diligence, at the time of the trial.

Mr. DANIEL read affidavits to show that, until Sir F. Bramwell gave evidence at the trial, the defendants had no knowledge of the plaintiffs' claim to a combination for producing two currents of air. That knowledge could not have been obtained either from the specifications or from the particulars of breaches delivered by the plaintiffs.

Their Lordships intimated that they could not accede to the application. The appellants' difficulty had arisen from the imperfect view they had taken of the real construction and nature of the plaintiffs' patent. To grant the leave asked would be to open up an entirely new contest; and the motion must be refused.

Mr. DANIEL then proceeded to argue that the plaintiffs' third claim rendered their patent invalid, in regard to the passage of the air through the chimney on its way to the flame. He said the inventor had there endeavoured to claim what Siemens had patented long before.

Lord Justice LINDLEY: Does not the "inner surface of the flame" for this purpose mean the surface of the flame next to the current of air?

Mr. DANIEL thought it certainly could never have been contemplated that the current should come down on the top of the horizontal flame. The idea was to bring it to the inner surface of a vertical flame. In conclusion, he submitted that Mr. Justice Williams's decision could not be supported.

Mr. JENKIN, following on the same side, contended that, even supposing the combination or the integers of the third claim had not been anticipated by Siemens's invention, they were still bad for want of subject-matter.

Lord Justice KAY: Have you any evidence that it was not a useful variation or improvement to bring air to the inner or upper surface of the flame?

Mr. JENKIN thought it a case of *res ipsa loquitur*. Siemens had, he said, a plan for heating the air by causing it to pass through the chimney; and nobody could have a patent for applying that method to the inner surface of the flame, because that was simply the application of an old known means to obtain an analogous result.

Lord Justice KAY: But how if it never occurred to Siemens to do that, and it produces a better result? Do you say there is not sufficient invention in that to entitle a man to a patent?

Mr. JENKIN: When you get an analogous application, that is for the decision of the Court.

Lord Justice LINDLEY: You say there is no substantial difference between this and Siemens's burner.

Lord Justice KAY: Admittedly, the light-giving power has been doubled by the plaintiffs.

Mr. JENKIN still maintained that a person could not, in law, have a patent for the application of a well-known means to obtain an analogous result.

Lord Justice BOWEN: Does that apply to a combination?

Mr. JENKIN: Yes; the combination in this case being only mechanism. Of course, the claim was not for producing the inner surface of the flame—that was given already; and desiring to bring heated air to it, a method was described of doing so.

Lord Justice KAY: And, in saying that, you assume that by doing so the illuminating power of the lamp is increased.

Mr. JENKIN admitted that, given the class of radial burner employed, the inventor set to work to bring to that radial burner air heated by the products of combustion; and he found that Siemens had a plan for bringing this heated air to a different burner.

Lord Justice KAY: And on the other side of it.

Mr. JENKIN assented; the current of air being applied to a vertical instead of to a horizontal burner. Therefore a plan was adopted for sending the heated air to the other side of the burner.

Lord Justice KAY: If the lamp is very much improved by the change, why should there not be sufficient for a patent in that?

Mr. JENKIN said the decisions in former patent cases were too strong for it to be said that this would be sufficient. The burner itself was not an essential part of the combination; and this was merely an application of the heated air to the inner surface of the flame, as required by the form of burner. It was but a means; and, by way of illustration, it might be said that "the means of driving to York would not include York." It was quite sufficient to take the plaintiffs' own claim. They claimed a method of doing something——

Lord Justice KAY: Which never had been done before.

Lord Justice LINDLEY: You say that Siemens has shown how to do this by bringing the current to one side of the flame, and for this he took out a patent; and that this is merely a patent for bringing it to the other side.

Mr. JENKIN: That is my case, in a nutshell.

Lord Justice BOWEN: But is it not that he is only pointing out a particular part of a general combination?

Mr. JENKIN: He is claiming that as a good invention.

Lord Justice KAY: Because there is novelty in bringing the current to the inner surface of the flame, which had never been done before, according to the evidence.

Saturday, Nov. 7.

Mr. JENKIN this morning resumed his argument on the construction of the plaintiffs' third claim, for the method of supplying heated air to the burner, and cited upon it the previous decisions applicable in cases of unfounded claims.

Lord Justice LINDLEY: The question is whether that can be fairly construed as claiming only a method of doing something in the particular lamp, or for the combination as described.

Mr. JENKIN urged that the Court could not, except by putting a forced construction on the language used in the specification, hold that it was a claim for anything but the old parts applied to an analogous use. If it were held to be valid, then, whatever form of burner might be used in the lamp, the current of air heated in accordance with Siemens's original patent could not be directed to the inner surface of the flame. Though an entirely different form of burner might be used, Clark would still be entitled to prevent anyone employing this mode of getting heated air to the burner, except upon payment to him of a royalty. On such a construction, therefore, there was no doubt that the claim was invalid. Siemens having already patented the idea, there was nothing new in this combination. The third claim of the plaintiffs was simply for the method of supplying heated air by sending it through the chimney on its way to the flame.

Lord Justice KAY: But that is the whole combination, is it not?

Mr. JENKIN: With great deference, no; because part of the combination was the arrangement for the current of air coming down outside. In fact, the patentee had tried to claim that to which he was not entitled, as it was really Siemens's plan. He had been too greedy; that was all it came to.

Lord Justice KAY: Siemens's was not a horizontal flame at all; that was the distinction between his patent and this. The patentee claims to have discovered that bringing the hot air to the inner surface of a horizontal flame produces a better result with that flame. Is it possible to say that this is not an invention—assuming, of course (as has not really been denied), that it produces a much better result?

Mr. JENKIN argued that, as a matter of law, whatever might be the merit or utility of the use the patentee made of the old process or the old combination of parts, if the application of them were analogous to the older method, it was not patentable.

Lord Justice KAY: If the analogous application involves considerable invention, and produces a useful result, it has never been held that it was not valid subject-matter of a patent.

Mr. JENKIN agreed that the point of utility had an important bearing on the question of subject-matter. In all the earlier cases, the utility had been either proved or admitted.

Lord Justice KAY: Take the case of a re-combination which nobody ever thought of before, the effect of which was to give twice the degree of illuminating power, would not that do?

Mr. JENKIN: In that case the patentee would be re-arranging the integers, and therefore getting an entirely new combination.

Lord Justice KAY: Is not that what has been done here?

Mr. JENKIN said not exactly; the patentee had also applied to an old, well-known form of burner, an old, well-known process or method of supplying air to that burner. In other words, he had applied Siemens's plan to a horizontal instead of to a vertical flame; and that was merely an "analogous use." If a patentee, having previously claimed a whole combination, afterwards chose to claim one part of it as his own invention, for the purpose of getting more profit out of his patent, he did so at his own risk. The plaintiffs' fourth claim, for the perforated continuation from the chimney, for the purpose of distributing the heated air over the interior surface of the flame, was bad. A man could not have a patent for making holes in a lamp-chimney, and prevent other people from employing them to bring air down to the upper or inner surface of the flame. On these two claims, he submitted that the plaintiffs' patent must be held to be bad.

Their Lordships intimated that they only desired to hear the respondents' Counsel on the point of the construction of the third and fourth claims.

The ATTORNEY-GENERAL, for the respondents, contended that the principles of all former decisions had been uniform—viz., that in a claim to a new article formed of old parts combined, the combination being new and useful, if a subsidiary claim were made referring to a new subordinate part of that combination, it must be construed, in the absence of direct language to the contrary, as a claim to that feature merely as a portion of the new combination, and not as a claim to it *per se*. It all proceeded, of course, on the assumption that the application of the method employed was meritorious, and the whole combination new. It had never been held, in previous cases, that such a claim referred to anything but a subordinate part of the new combination. This point was decided in the case of *Sugg v. Silber*. The defendants in the present case had gone too far in saying that Siemens described in his specification exactly the same arrangement as here. According to the scientific evidence given, this was by no means the same method of bringing air into the lamp. Upon this point, the learned Counsel referred to particular passages in the specifications.

Lord Justice KAY: Is it fair for the Court to construe this claim as a mere repetition of the previous claim? If so, why was it made? Must it not have been intended as a distinct claim?

The ATTORNEY-GENERAL said the claim was only to part of the new combination—omitting the downward current. The defendants must go the length of saying that, both on the points of subject-matter and of novelty, it was not a valid invention to adapt to a flat or horizontal flame burner the same method as had been used for the Argand or circular flame burner. Nobody had denied or could deny that the plaintiffs' results were new and useful. The defendants could not stop short of saying that a claim which, on its face, was confined to bringing heated air to the inner surface of a flame in the particular combination, must be read as being a general claim to the bringing of heated air to the inside of the flame. This was not what the patentee intended; he had only described the method of doing so when it was not required to convey the air to the other side. Siemens had not shown anything but that it was advantageous to bring heated air to a gas-flame. His invention had nothing to do with shape, either of flame or burner, or anything but the effective illuminating power. The whole point was that hot instead of cold air was to be brought to the flame. In those circumstances, why was not this a good claim? It had not been suggested, in the evidence, that anything of this kind had ever been done before. The learned Counsel then proceeded to contrast in detail the lamps in question, by the aid of the models produced. It was not an essential part of the third claim that the second current of air should be provided. No evidence had been given that Siemens's lamp had ever been used; it was a mere paper anticipation. Though, of course, Siemens was one of the cleverest men in the construction of gas-lamps, he had actually failed to perceive, even in his own lamp, the advantage of providing, in addition to heated air, a second cool current. Why was not this a good claim, including, as it did, everything that was necessary for bringing the heated air down? Doubling a claim, or merely repeating it, did no harm. It would therefore be unjust for the Court to invalidate this patent on that ground; and the best construction must be put upon the claim in question, having regard to its obvious reference to the parts of the specification already described. On these grounds, he contended that the judgment in the Court below should be affirmed.

Mr. ASTON followed on the same side, and pointed out that the test of the subordinate claims was that they were merely claims to the use of those particular integers of the combination of parts comprised in the patent under the conditions expressed in the specification, and under no other circumstances. The various claims were therefore, he maintained, perfectly valid.

Mr. DANIEL having briefly replied, their Lordships gave judgment.

Lord Justice LINDLEY said the appeal was from the decision of Mr. Justice Vaughan Williams, in an action by certain patentees for the infringement of their patent relating to lamps. The usual points were raised by way of defence, with one exception which it was important to bear in mind. There was no plea or objection put forward on the ground of insufficient specification. This would get rid of a good deal of discussion which might possibly have arisen. The main contention was that the patent was bad, and that there was no infringement. Now, as to whether the patent was bad, either from want of novelty or utility or of subject-matter, the Court must ascertain, as far as possible, what was the condition of things at the time the patent was taken out; and attention had been specially drawn, and very properly, to Siemens's inventions. The particular patent with which the Court was dealing was Clark's. It was taken out in December, 1881; and it was amended in 1888. It was for improvements in lamps. Siemens had discovered the importance of having heated air brought to incandescent gas, or flame, and also of heating the gas itself before it reached the burner; and in his specification he described a method of accomplishing these objects. He showed the advantages of that method; and he indicated how to do it. He brought the feeding current through the chimney in the way described in his specification and drawings. This idea was naturally seized upon and adopted by the plaintiffs as later inventors. It was a very valuable idea, because it seemed obvious, now that everything was known about it, that it was an important discovery. Siemens's mind was addressed to the value of more effectively burning the gas by bringing a current of hot air to the flame, and also by heating the gas before it reached the burner. This was what his mind was upon—not upon the method of bringing the hot air to a flame of any special shape. But the direction of the later patentee's mind was just the other way. It was addressed to the particular method of bringing a supply of heated air to a flame of a certain shape, and to a definite part of the flame. His method was a step in advance of that of Siemens. He took Siemens's idea as far as it went, and had produced a new and very valuable result—a much better flame. The hot-air current which fed the flame in Siemens's case was brought down, not to the gas-pipe, but to somewhere above it. It was the ascending current in Siemens's case which operated upon the gas-flame. In Clark's patent it was just the other way. He so arranged his concentric ring or burner, or tubes, as to bring his hot feeding current down upon the middle of the particular kind of flame which he selected for the purpose of his lamp. In addition to this, he had availed himself of what Siemens apparently did not—viz., the cooling current, to keep down the temperature in the lamp, and prevent the globe from cracking. This being the state of things, and these being, in a few words, the difference between the ideas which Siemens and Clark had, the Court must look at what the latter had stated in his amended specification. It was unnecessary to go through it at any great length, as only those parts which had been commented upon need be referred to. The drawings were common knowledge, and only one (plate 5) need be dealt with. After describing generally the arrangement of his tubes and apparatus for producing the desired result, and bringing the current of hot air to the interior surface of the flame, and following the course of the current (shown by arrows) intercepted above the burner, he said it was obvious that the bottom of the supply-tube must be perforated, otherwise the arrows would be of no use; and a minute examination of the drawing of the tube showed that the patentee intended that there should be a place through which air could pass. The perforations were not shown in the drawing; but from the arrows, it must be perfectly obvious that this was what was in the inventor's mind. Next came the burner, which must be considered in reference to the object of the invention. The drawing was of a burner equal, or possibly a little exceeding in size the bottom of the tube. There was nothing to indicate whether or not this was essential. Nozzles were shown projecting from the ring or burner in such a way that the jets forming the flame were to issue in a horizontal direction. What was to be done with them? Whether they were to assume a cup-shape, as had been pointed out, was not shown; but this could be ascertained by experiment. Still, one could not read the specification and miss the leading idea that the hot feeding current of air had to come upon the top or middle of the ring of horizontal jets. The arrangement of jets was of importance. Whether the flame became saucer-shaped or was

flat was unimportant. What was important was that the jets should be arranged in the form of a ring, projecting horizontally, and the current of hot air was to strike in the middle of the arrangement. That this was the essential part of the patent must be perfectly obvious to anybody who studied the specification and drawings. Passing to the patentee's claims, he claimed the particular arrangement and construction of the improved lamp "therein described, and represented in the accompanying drawings." That was to say, he claimed the whole of his combination, and the particular method of supplying hot air to a ring of horizontal jets; and in that part of his specification he claimed this in combination with the cooling current which was elsewhere described. If the matter had stood there, possibly a difficult question might have arisen, whether he could support such a claim as the third. If the patentee had left out entirely the cooling current, there would have been a difficult question to be dealt with. But he had anticipated and guarded against this difficulty by claiming thirdly the "method," as previously mentioned, of supplying heated air. The Attorney-General had rightly maintained that he was perfectly justified in doing so. He had claimed the particular mode of supplying heated air to the inner surface of the flame, by causing it to pass through the chimney to the flame, substantially as described and represented in the drawings. In other words, he had said: "Mind, whether you take my cooling current or not, I claim this particular method of supplying heated air to this kind of flame, as described in my specification." Now, what was the objection raised to this claim? It was objected that it made the patent bad, having regard to what was known before, and to what the specification of Siemens had disclosed. It had been contended that this was not the subject-matter of a patent—that it was merely an analogous use of an old arrangement pointed out by Siemens; that Siemens had described how to bring heated air down to a flame; and that whether it was brought down on one side of the flame or the other was immaterial, and could not be the subject of a patent—in short, that there was no invention anywhere. The answer to this was furnished by contrasting the two arrangements. Clark's patent was different, and vitally so, from that of Siemens, and was addressed to a totally different object. Invention was shown, as could be discovered by anyone without the evidence which had been given; but when the arrangement was looked at with the evidence, the conclusion was clear and strong that this patentee had hit upon something which was a distinct advance upon Siemens's lamp, although possibly, but for Siemens's previous discoveries, he would not have been in a position to invent this lamp at all. A great deal of comment and criticism had been passed upon the third claim; but it was not, in his Lordship's opinion, difficult to construe. The duty of the Court was to consider a patent with the view of understanding it; and it did not concern the Court judicially whether the result of that consideration was to make the patent good or bad. The object was to understand what was meant; and the meaning of the claim was tolerably plain. It was a claim to the method of supplying heated air to the inner surface of the flame. A great deal of argument and criticism had been addressed to the expression "the inner surface of the flame;" but, upon thinking the matter out, it was obvious that what was meant by "the inner surface of the flame," and in other places in the specification "the interior part of the flame," was the side presented to the feeding current of hot air. If the flame were quite horizontal, it might be called the outer side; and in that case there would be no difference between the terms "inner" and "outer." Whether the burner could be so arranged as not to give a horizontal flame was another thing. But there was no ambiguity about the matter, and no question at all that it was not the inside of each particular jet that was meant, or that part of the unburnt gas within or at the centre of the flame. That what was meant was the side presented to the hot-air current, must be tolerably obvious to anybody who would apply his mind to the specification with the view of understanding it. Then a good deal of comment had been made upon the construction of the claim as to rendering inoperative the portion of the patent with reference to causing the air to pass through the chimney. The answer to this argument was that it omitted the reference to what had been "hereinbefore described and represented in the accompanying drawings." What was claimed was "the particular method of supplying a hot-air current to the flame, as described and mentioned in my specification." One method was by passing it through the chimney, as Siemens did; and this was a perfectly justifiable claim—a perfectly good claim—treating it as a subordinate integer of the general combination. With regard to the fourth claim, there were two ways of reading it. One was, as the appellants had contended, to read it as a claim simply to the use or employment of a perforated continuation of a tube for the purpose of distributing the hot air over the interior surface of the flame; and the Court was asked to say that, read as a substantive claim in this way, it was bad for want of invention. One answer to this was that the Court could not judicially so hold. There was no evidence to show that this was the proper inference; and the Court could not, possessing common knowledge of the ordinary events of the world, come to this conclusion. But another and better answer was that this was not the true construction of the fourth claim, which was that it pointed out the importance of the perforated tube in claim 3. It appeared to be nothing more than this; and if that were so, it would not vitiate the claim, which might, on that account, be open to the objection that it was redundant. But if it did nothing more than point out a valuable portion of what had been claimed in No. 3, the mere repetition would not invalidate it. Having reviewed all the objections offered, the Court must hold that this was a perfectly good patent. Next came the question whether the defendants had infringed it. In deciding this, the Court must consider what the invention was; because, unless this were kept in view, the variations which had been referred to, and which might be really immaterial and unimportant, might mislead. In considering those differences, full recognition must be made of the real nature of the invention. Two important differences existed between the plaintiffs' and the defendants' lamps. First, the outside chamber of the plaintiffs' lamp was separated by a vertical division, thus forming two chambers; while the defendants' had only one. Was this a material difference or not? What bearing had it upon the essence of the invention? In the judgment of the Court, none at all. It did not touch, and was outside it. Only after that portion of the arrangement was passed was the really important part of the plaintiffs' invention reached. Another point of difference was the burner. The defendants did not use the one delineated or described in the plaintiffs' drawing—viz., one with projecting nozzle sbut a smaller, and possibly a better burner. This might very likely be so, as had been contended. But there, again, although the difference might be of some importance, had not the defendants obtained the leading idea of the plaintiffs' patent? That leading idea was to have such a burner that the feeding current of hot air would come down to the middle of it, and fall upon the jets of flame as they projected from the ring. They had this; and that was, in the phrase used by Lord Cairns in the horse-clipper case, "the pith and marrow" of the arrangement. In this respect, therefore, they had infringed the plaintiffs' patent. This point apparently had not been fought out at the trial, though it was referred to. Certainly it was not proved in evidence that there was any distinction in principle between the defendants' smaller burner and the plaintiffs' larger one. Reference to the decided cases was not necessary to show that an improvement might still be an infringement if, as the Court must decide had been done by the defendants here, that which differentiated the patent from the original source (Siemens's) had been taken, or the substance of it. In that case the patent had been infringed, although trifling variations had been made which, if they had been improvements, might have prevented their being regarded as mere infringements. Accordingly, the decision in the Court below was right; and the appeal must be dismissed, with costs.

Lord Justice BOWEN said he was entirely of the same opinion, and would only add a few words to the judgment just given. The action was for the infringement of a combination. In the first place, what was the real invention comprised in the combination—what was "the pith and marrow" of it? Having discovered this, as described in the specification, the next question was whether it was properly described—neither ambiguously nor too largely. Having decided these two important points, the next question was whether or not the patent had been infringed. The real character of the invention had already been so fully described by Lord Justice Lindley that it was impossible to add anything. It need only be said that it consisted principally of the feeding current of hot air brought down to the middle of the horizontal circular flame; and, secondly, of the addition in the combination of the cooling current round the lamp. Were these claims properly described? Undoubtedly, the second claim pointed out the combination, by reference to the drawings, in a way which really included the main point of the invention. The third claim had been rightly explained by the Attorney-General as being a concentration by the patentee of his ideas upon the particular point of the application of the heated air current to the inner surface of the flame, as constituting in itself so much the essence of his invention, that, even if the cooling current were left out, to take that would be taking his invention. Upon the fourth claim, nothing need be added to what Lord Justice Lindley had already said. The application of heated air being the essence of the invention; and there being no real objection to the way in which it was claimed under the third and fourth heads, what had the Court to consider? Had "the pith and marrow" of the invention been taken? If so, it was no excuse to say that something had been added or omitted, even though the addition or omission had been useful and valuable. The superaddition of ingenuity to robbery would not make the robbery justifiable. That the new lamp, which was the result of having taken the invention of another person, was an improvement upon the other person's property, would not excuse the borrower of the idea for taking that which did not belong to him. The Court had therefore simply to consider whether the differences which had been made in the defendants' lamp, in comparison with that of the plaintiffs, were such as to prevent their being chargeable with having appropriated the principal feature of the invention. That was the point upon all the decided cases; and when once it was seen that the defendants had taken what was indicated in the third claim as the very essence of the invention, the differences by which it was sought to excuse the infringement must be held not to make it less an infringement.

Lord Justice KAY entirely concurred in the judgment; and for the reasons given.

Mr. ASTON asked for costs on the higher scale.

Lord Justice LINDLEY remarked that they had not been given on the higher scale in the Court below.

Lord Justice BOWEN said the Court had no power over that.

The appeal was accordingly dismissed, with costs.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Monday, Nov. 9.

(*Before Sir* P. H. EDLIN, Q.C., *Chairman, and a Bench of Magistrates.*)

The Gaslight and Coke Company's Assessment Appeals.

(*Continued from p.* 905.)

The evidence in this case having closed, the proceedings to-day opened with speeches by Counsel.

Mr. POLAND, who first addressed the Court on behalf of the respondents, drew attention to the enormous deductions claimed by the appellants. He said that in the City parishes the old valuation, upon which the Company had been paying during the last five years, was £29,000. On the new list, this was raised to £52,000; but the Company claimed a reduction to about £25,000. In Marylebone the figures in the old list were £26,500. The Overseers put in the same amount; but the Assessment Committee raised it to £29,000, and the Company claimed a reduction to £10,000. In St. Giles's and St. George's, the old list, which was adopted by the Overseers and the Committee, was £8498; and the Company claimed a reduction of £3695. In Paddington, a reduction from £17,284 to £6728 was claimed. In Hampstead, the old list was £10,560; the new one, £10,655—the Company claiming a reduction to £3800. In Paddington, the old list was £13,574; the new one, £17,284—the Company asking for a reduction to £6728. There were similar enormous reductions claimed in the other parishes. In the first case filed by the Company, and based upon

the accounts for 1889, the total rateable value was given at £666,802, from which £371,951 was deducted for dead or indirectly productive mains; the total rateable value of the directly productive portion (after a further deduction for rates and taxes) being brought out as £234,319. Last May, after discussion, the Company were allowed to prepare a new case; and this they did by leaving out the first half of 1889, and substituting the first half of 1890. The second case showed this remarkable fact, that the substitution of one half year for another had brought the total rateable value of the directly productive portion down to £113,667—a difference of £120,652. In the first case, the expenses of the Company were put down at £2,019,880; in the second, this figure was given as £2,239,884. There were also discrepancies between the figures adduced by the various witnesses; but he admitted that they were inevitable in valuing a large concern like that of the appellants. In regard to the tenant's capital, in the second case that was set down at £1,705,577; Mr. Jones put it at £1,755,374; and Mr. Woodall at £1,965,500. The questions raised here not being purely gas engineering ones, the Company did quite right in engaging Mr. Vigers and Mr. Castle—men who were known as thoroughly straightforward, honest men, who would not in one case say one thing and in another case something else—men who had their own principles of rating, whether valuing for the Company or the parishes. These gentlemen were sent round to the Assessment Committees to discuss the matter with the rating surveyors; but, although they were in Court day after day, and although the Company were taunted over and over again because they were not called, they were never put into the box. Could the Court doubt that these two gentlemen had made a valuation which in no way agreed with the valuations of Mr. Jones and Mr. Woodall? He did not wish to tie the Company down to the figures originally arrived at by Messrs. Vigers and Castle; but why were they not put into the box upon the amended case? The tenant's capital had been arrived at upon an erroneous system, by including tools, appliances, and stores properly belonging to the landlord. All the authorities held that care must be taken that stores for the repair and the renewal of the hereditament itself were not taken into the estimate of tenant's capital; and this had been held over and over again, from the well-known Lee case down to the Tyne boiler case. In 1866 there was what was known as the Maidstone case, in which the Kent Court of Quarter Sessions, presided over by the present Lord Cranbrook, allowed a deduction in respect of "meters, retorts, tenant's trade fixtures and utensils." This was appealed against; and the Court of Appeal held that the imaginary tenant would only have to take the meters, which did not lose their character as chattels when they were put on to the consumer's premises merely for the purpose of measuring the gas supplied as between the company and the consumer. Everything else referred to in that case was not to be included in the tenant's capital, although by the practice of the trade, as well as by custom, those particular things were usually taken by a tenant upon going into the occupation of gas-works.

The CHAIRMAN remarked that Lord Blackburn's judgment in the Lee case was very comprehensive, and had a direct bearing upon the present appeal.

Mr. POLAND added that in all the subsequent cases the law was stated by the Court of Appeal as being the law laid down in the Lee case. He protested against the tone of Mr. Littler's cross-examination of Mr. Valon, and drew the Court's attention to the fact that that gentleman was now the President of the Incorporated Gas Institute. In accordance with Mr. Valon's and Mr. Chester's evidence, he (Mr. Poland) argued that all a prudent and provident tenant would require in the shape of capital would be about £1,000,000. The learned Counsel added, in reply to the Chairman, that if it should be found that any parish had under-estimated the rateable value, he could not, of course, ask for the amount claimed by the parish to be increased.

The CHAIRMAN said, without prejudging the question, that the fact of another half year being put into the second case might justify any parish which had under-estimated its rateable value applying for a revision upon a supplemental list.

Mr. POLAND (continuing) admitted that for some years past 17½ per cent. had been allowed on tenant's capital; but he argued that the time had now come to revise this percentage. He contended that 15 per cent. would be ample. On a million of money in Metropolitan stock, one would get £30,000; 15 per cent. on the million would be £150,000. At such a percentage as the respondents proposed, the money could easily be procured in the City within a week. On the question of the parliamentary charges, he contended that the hypothetical tenant, who was supposed to be in from April of one year to April of the next, would have no need whatever to go before a Parliamentary Committee. If the tenant found that steam-rollers crushed his mains, he would take this into account the next year, and say to the landlord: "If you cannot have the mains protected, I shall pay you so much less rent."

The CHAIRMAN said it was difficult to accept in its entirety the proposal that all these parliamentary charges were the landlord's and not the tenant's; because the tenant, not the landlord, was the Company, and only the Company could appear before a Committee.

Mr. POLAND replied that the appellants were contending that the whole amount was a tenant's charge; but some of it, at any rate, must be a landlord's. The learned Counsel then briefly dealt with other items in the valuation, and urged the Court to adopt the figures put forward by the respondents in their recent evidence. On the question of the indirectly productive portion of the works, Mr. Jones had, he said, estimated the gross value of the works at £5,114,172, and the annual value at £282,378. Mr. Eve and Mr. Valon put down the annual value at £220,000; Mr. Chester, at £249,000; Mr. Ryde, at £250,000; Mr. Cook, at £279,000; and Mr. Marshall, at £282,000 (Mr. Jones's figure). For this purpose it was important to say which were indirectly productive mains. Mr. Eve and Mr. Valon were willing to take the high-pressure mains, which were employed to convey the gas from one set of works to another, and from Beckton to London; Mr. Marshall took as indirectly productive mains all those which were over 30 inches in diameter; and other witnesses took all above 14 inches. Mr. Jones, for the appellants, put down £19 as the cost of mains for delivering a million cubic feet of gas; and he held that any cost over this sum in any parish was not required for that parish, and should therefore be put down as indirectly productive.

The CHAIRMAN said he had been very much struck by the figures given by Mr. Ryde; and, having regard to the fact that Mr. Ryde had for years been inclined to take a liberal view of the tenant's capital, he would be very glad if arguments could be addressed to the Court in favour of adopting the medial figures put forward by that witness.

Mr. CASTLE (for the appellants) said he would mention the matter to his clients and to Mr. Littler.

Mr. POLAND then referred to what he termed Mr. Littler's "bogeys." As to the idea of a strike throwing all London into darkness, he said the Government would never let such a thing occur. On the question of competition by electric lighting, he drew attention to the extra cost of electricity, and to the expense of taking down gas-fittings and substituting others for the new illuminant.

The CHAIRMAN said if it should hereafter be found that the introduction of electric lighting in any particular parish had seriously affected the earnings of the Company in that parish, the Company would be entitled to have the question dealt with in the provisional or supplementary list.

Mr. FULLARTON, in addressing the Court on behalf of the St. Saviour's Union, denied that the respondents were to be bound down to the lowest of the figures put forth by their witnesses. These were adduced as having been arrived at by experts, not as being the actual figures submitted for the assistance of the Court. The respondents had brought all their witnesses forward; they had not burked those whose figures were against them, nor had they allowed only those who were most in their favour to give evidence. On the question of the parliamentary costs, he submitted that if these charges, which had been actually incurred, had been altogether a tenant's expenditure, both Mr. Littler and Mr. Castle were alert enough to have produced the items in order to show that the landlord was not liable. There was, however, no evidence before the Court which would enable one to distinguish between the landlord's and the tenant's parliamentary expenditure. With regard to the value of the business, for the last four or five years, the accounts showed that the receipts from the public were steadily diminishing, but that at the same time the dividends were steadily increasing; so that the shareholder—in other words, the tenant—was getting more out of the business. The Company had, in point of fact, deliberately lowered the price of gas in order that they might dip their hands into the accumulated fund, which otherwise they could not touch. He therefore contended that the value of the concern was not to be measured by the takings from the public in any year, but by the statutory dividends divisible among the shareholders under the Act.

Thursday, Nov. 12.

Mr. FULLARTON, continuing his address, said, as to the 17½ per cent., that this was not a point confined to this case. Any decision the Court might give here would have far-reaching consequences, and would go to the root of valuing in these matters.

The CHAIRMAN: Each case would have to be dealt with individually. We must look to the enormous extent of this Company, and of the profits earned by it; and we must deal with it according to the evidence before us. Our decision would not necessarily be any guide to the decision in another case.

Mr. FULLARTON argued that this 17½ per cent. had been for a very long time in existence, and from the first had been a maximum allowance—no greater having been made in any reported case. Obviously, as the business varied, so should the allowance; and this, which had never been exceeded for the most risky business, should surely not be exceeded in the least risky. The Act prescribed in exact words that only the actual amount of the repairs should be allowed; yet surveyors allowed maxima all round, without any distinction as to the actual cost of the repairs. When the 17½ per cent. was adopted, the value of money in the market was very much higher than it is at present. This change did not merely affect the 5 per cent. allowance for interest on the invested capital, but just as much the 10 per cent. beyond. In fact, this affectation of dividing the 17½ per cent. for trade risks, as compared with other investments, into 5, 10, and 2½ per cent., was unwarranted. It really was a trade profit, to cover all trade risks. Every investment was more or less risky, even Government Three per Cents. or railway debentures. Therefore, the moment the market value of money fell, the intending investor was willing to take less trade profit all round for his money. In the last ten years of the Company's existence, the dividend paid had never been equivalent to 17½ per cent. It had varied from 11 to 13⅜ per cent.; and it was at about its highest now. Investors, therefore, would now go into the Company on the anticipation of these rates of interest. According to the Stock Exchange Share List, on Nov. 6, 1891, the ordinary shares of the Company commanded the price of £217.

The CHAIRMAN: The average dividend was 13⅜ upon £100 nominal ordinary stock. You say that nearly six months afterwards that stock commanded £217 on the Stock Exchange?

Mr. FULLARTON: Yes; that was the price paid last Friday (Nov. 6).

The CHAIRMAN: You present that as a criterion of the value of this stock in the estimation of persons who might have money to invest, and who would not look for 17½ per cent., but would be content with a little more than 6½ per cent. You say that is inconsistent with the demand for 17½ per cent. upon the capital necessary to carry on this undertaking, although in other cases the Court may have allowed it?

Mr. FULLARTON: Exactly. This is a statutory Company; and under its Acts it has rather peculiar stocks. It is provided that no dividend higher than 4 per cent. per annum in respect of the "B" shares, and none higher than 7 per cent. per annum in respect of the "H" shares, shall at any time be paid.

The CHAIRMAN: What is the average amount paid on debentures?

Mr. FULLARTON: They have a 4 per cent. debenture stock, which sells at 112 to 115.

Mr. STROUD: The 4 per cent. stock is at 112; the 4½ per cent., at 120; and the 6 per cent., at 163.

The CHAIRMAN: Then the Company can borrow money at something materially less than 4 per cent.?

Mr. CASTLE: That is absolutely secured.

Mr. FULLARTON: However, in face of thes figures, it is preposterous

to say that nobody will invest in this Company, to get 13 per cent., under 17½ per cent. The learned Counsel proceeded to deal with the argument that this was an undertaking involving abnormal risks. He put it, on the contrary, that it was a safe monopoly. As to the competition of paraffin, this had actually been experienced; but the output of the Company had increased instead of diminished. That electric lighting was not to be feared was shown by the comparison of the price of gas companies' stock and that of electric lighting companies' stock. As to strikes, the Company was in an exceptionally favourable position; because, to protect the commercial life of London from the disaster which would be involved in a sudden total cessation of the gas supply, the Government lent the Company the services of the military and other forces. In conclusion, he expressed the hope that "this venerable old bogey" of 17½ per cent. all round to everybody—irrespective of the enormously varying risks run, and of the fact that, even if this figure were right at the time it was introduced, it was not a proper maximum now, because of the enormously decreased value of money—would altogether disappear, especially as this was a Company protected by statute, protected by Government, and enjoying a monopoly over the best part of London.

Mr. MARSHALL followed, on behalf of the parish of St. Luke's, Chelsea, and argued that that parish had reasonably treated the Company in the assessment they had made. He also dealt with the expenditure for fixing and repairing stoves, and read a table prepared from the accounts of the Company. He showed that in 1888 there were 6933 stoves, and that the expenditure was £7464, or an average of £1 4s. 5d. per stove; that in 1889, there were 8599 stoves, with an expenditure of £11,797, or an average of £1 7s. 5d. per stove; in 1890 (the account year), 16,679 stoves, with an expenditure of £37,508, or an average of £2 4s. 9d. per stove; and from Midsummer, 1890, to Midsummer, 1891, 27,243 stoves, with an expenditure of £44,616, or an average of £1 12s. 9d. per stove. So that this expenditure was at its maximum in the account year, and was falling to a very considerable extent. He further pointed out that the figure for "repairs" included repairs, renewals, and depreciation. The question for the Court was whether the 6d. given by the Company's valuer was a fair average of the expenditure for repairs, renewals, and depreciation over a reasonable number of years. He suggested going back, not the seven years, but nearer the quinquennial period—say, five years; because in the earlier period the expenditure upon materials was higher, and there had been subsequently a great saving on establishment and staff expenses through the amalgamations, and great economy had been induced by the operation of the sliding scale. With regard to tenant's capital, he submitted that no allowance ought to be made for repairs to certain of the mains and retort-houses, because they were, in fact, landlord's repairs. A deduction of £108,000 in respect of these would leave £140,000 to be taken for tenant's capital, at either 4½ or 5 months, as the Court determined. The tenant's repairs could only be repairs to what was described as loose plant; and the loose plant, he contended, should be taken at £106,000, the amount given by Mr. Vigers on behalf of the Company before the litigation began to be vigorously prosecuted. The item of £625,000, for "book debts, gas, and sundries," was most misleading, as it represented not merely capital, but the whole of the profit. The amount applicable under this head to tenant's capital was only £174,000.

The SOLICITOR-GENERAL, in summing up the case generally on behalf of the different respondents, pointed out that they had been placed in some difficulty by the decision of the Court that the accounts should be taken for the period terminating in June, 1890, instead of that ending in December, 1889; their case having been prepared on an investigation of the accounts for the latter period. Then, when they went before the Assessment Committee, two gentlemen of eminence and repute handed in, on behalf of the Company, certain figures. But before the Court the Company submitted a new set of figures, and also a new case founded on these figures, which varied the rateable amount at which they claimed to be put in the several parishes. This change of front was made at a time when the parties were actually in conflict, and after the expense of valuation had been incurred. Dealing with the question of distribution between the directly and indirectly productive portions of the undertaking, the learned Counsel said he presumed that, when once the Court had fixed upon a definite sum as the rateable value, there would be no difficulty in dividing it between the different parishes. It would be for the Court to lay down some principle upon which the directly and indirectly productive works were to be distinguished; but the appellants could not be in any way interested in this distribution. Two or three suggestions had been made as to the way in which the division should be arrived at. Mr. Jones—a man of certainly unlimited intellectual energy—appeared to have occupied his leisure time in inventing an entirely new test of distribution; and this test departed absolutely from every suggestion which had been made by any engineer or surveyor. He arrived at a figure of 19, which he said was his experience of the value of the undertaking which produced a certain delivery of gas; and then, by finding the delivery of gas in this case, and applying that figure to it, he succeeded in distributing the rateable value to his own satisfaction. It was extremely ingenious, and was very pleasant to listen to; but he (the Solicitor-General) hoped that, having enjoyed that pleasure, they might now finally and for ever dismiss it, especially as Mr. Jones said that he really did not mind what was done with regard to it, because it did not affect the Company. Simpler tests had also been suggested. One was to fix a certain dimension of pipe, and say that only pipes below this size were directly productive; while another was to adopt the division shown by the Company on their coloured maps—blue and red marking the difference between high-pressure and low-pressure mains. It was for the Court to decide upon the principle, and the parishes could arrange how the division was to be carried out as between themselves. Referring to Mr. Littler's cross-examination of certain witnesses as to their experience and reputation, the learned Counsel said he would not discuss the qualifications of witnesses in a matter of this kind, because, when an experienced Court listened to expert evidence, it was affected not only by the witnesses' experience and public reputation, but the way in which the evidence was given, and by the capacity shown by them for addressing themselves to new problems, or to new variations of the old problems, which might be presented in cross-examination. His learned friend would probably, in submitting his case to the Court, comment upon the varying estimates given by the different surveyors called by the respondents; and he had sought, in his cross-examination, to get the admission that certain figures were merely "guesses." He (the Solicitor-General) contended that, in a case like this, it was hardly fair to speak of the expert witnesses as "guessing"; for having to say how much the property was worth, and to assist the Court by their experience and judgment, they looked at the whole problem. It might be that witnesses would differ in their manner of dealing with particular items; but it would be extremely unfair to take certain items and consider them as detached from the rest of the valuation. In the matter of tenant's capital, the real question was, not whether 17½ per cent. should be granted upon a particular figure, or whether a particular figure should be arrived at upon which 12½, or 15, or 17½ per cent. should be allowed. There were means of getting at the result at which the Court desired to arrive; but the real question was, What allowance ought to be made to the tenant in consideration of the capital he would have to find for the purposes of the undertaking? Obviously, if one dealt with the tenant on the footing that he should be allowed as capital simply the money required for immediate use, different considerations would arise as to the amount to be allowed for interest and tenant's profit. It might be said: "We have cut down the capital to its very lowest point, and therefore we think that a high interest should be given, and something extra for risks and casualties." If, on the other hand, a large allowance were made, covering any conceivable claim of the business on the resources of the tenant, then the percentage, which might not be unfair as applied to the narrow and restricted capital, would be positively ridiculous as applied to the large capital. The question was how much the tenant should be allowed, having regard to the liabilities that would fall upon him. Whether this was arrived at by putting a large percentage on a small capital, or a small percentage on a large capital, would not affect the mind of anyone trying to solve the problem so much as the question as to what sum of money ought to be arrived at. Mr. Eve, he submitted, was perfectly right when he took 15 per cent. on £1,000,000, or £150,000. This might be taken to represent 15 per cent. on the whole £1,000,000, or it might be divided into different percentages upon constituent parts of that sum; but it was immaterial which view was taken. This illustrated the danger and the unfairness of taking a bit of one witness's evidence and a bit of another's, and piecing them into a sort of mosaic which the Court should adopt. As he asked the Court to accept figures substantially higher than those of Mr. Ryde, it was his (the Solicitor-General's) duty to point out that that gentleman's valuation did not bind the parishes for whom he did not appear. Without repeating Mr. Poland's argument on the legal decisions upon what constituted a rateable hereditament, and how far repairs to the hereditament could be dealt with as landlord's or tenant's expenses, he would point out that generally the great difficulty in applying the rule laid down in those decisions was the question of the hypothetical tenant. But here the Company were both landlord and tenant; and therefore it was simply a matter of book-keeping. It was impossible to say that there was one set of persons the servants of the tenant, and another set the servants of the landlord. The staff were engaged sometimes on the work of the landlord, and at other times on the work of the tenant. The appellants had suggested that there was a contract by the tenant to do the repairs; and that therefore he must be allowed a sum of money with which to provide the materials to carry out his contract. But the overwhelming answer to this was that the Court was not called upon to "hypothesize" such a contract, because it had the actual fact that the landlord was there with persons in his employment doing from time to time everything falling upon the landlord to do. The evidence was that the condition of the place was perfect. Mr. Jones's calculations as to the expenditure were worthless, because they were not based upon the actual figures of the Company's working. For instance, he took 5·96d. as the cost of producing a certain quantity of gas; whereas, working out the figure over the time during which the Company had been in existence as a single Company, it was something less than 4d. Dealing with the very important matter of repairs, the learned Counsel said the premises consisted of buildings, offices, retorts, mains, distributing-pipes, &c. All these were the tenement, and the only thing that could require repair was the tenement, which was let to the tenant. But according to the reported decisions, every repair that was a repair of the tenement, and related to its replacement in complete efficiency and good condition, was an expense which, whether borne by the tenant in the first instance or not, or whether, as in this case, effected by the person who for this purpose was the servant of the landlord, did not matter the least in the world; the hypothesis being that somebody had to do the work, and that when once the difference between the gross and the net rateable value had been arrived at, it all had to be debited to the landlord, and was the landlord's expense. It was clear, upon the accounts in this case, that a very great portion of the loose plant and materials, and so forth, was attributable to the landlord, and the landlord only; yet Mr. Jones put upon the tenant the whole of the expenditure, and then added a large amount for machinery. The sound view was that the repairs were the landlord's—all of them being substantially repairs to the structure which he had let to the tenant in order to command his rent—and that they should all be debited to the landlord, subject to the simple allowance of £30,009. As to Directors' fees and salaries, obviously some proportion ought to be treated as landlord's expenses; and he submitted that one-twelfth was a very moderate amount. With regard to parliamentary charges and expenses, he submitted that the appellants were not entitled to claim anything. On the provision of tenant's capital, the appellants insisted on his being the tenant for one year only. If this assumption were correct, it should be made all round. Supposing that in the summer of one year (the tenancy being from April to April) a Bill passed through Parliament entitling an electric lighting company to put down their mains in a particular district where the Gas Company were afraid of competition, who would be specially interested in preventing this because he would be injured by it if it passed? Clearly not the tenant, whose tenancy, on the hypothesis, would come

to an end in April, before any mischief could be done, but the landlord. The tenant's capital was built up by Mr. Field and Mr. Jones in different ways. The former took five-twelfths of the annual expenditure; the latter looked at the condition of the concern at the beginning of the year, found out how much was coming into, and how much going out of it, and took the balance between the two. Mr. Field arrived at £529,000; Mr. Jones, at £625,000. To show that the latter calculation was not well formed, the hypothesis was that the incoming tenant took over, at their full value, all the debts owing to the Company, and proceeded to enter into the enjoyment of those debts; and upon the amount of £625,000, it was suggested that he should be allowed 17½ per cent. for the year. But the whole of that £625,000 would come back in the first quarter. Moreover, what a man required in his business was the money to enable him to carry it on; and as, directly he got into the full swing of work, money would be coming in, all that had to be provided was the actual outgoings at the commencement. Mr. Field's was the proper plan of arriving at the tenant's capital; and the only question was whether three-eighths or five-twelfths of the annual expense should be adopted—whether 4½ or 5 months should be allowed. In dealing with the Company in this way, a very considerable advantage was gained, because it was dealt with as if on the 1st of April the tenant was coming in to begin a new business, getting nothing from that which had gone on before—buying the equipment of the place, and having to begin business afresh. But here the hypothetical tenant was the actual tenant. As in the School Board cases it was held that the Board itself was the hypothetical tenant, and that the rateable value might be dealt with on this footing, so here the hypothetical tenant was in occupation from year to year. On the question of the additional allowance for coal, there was a difference of no less than £200,000 between the appellants and the respondents, because the former claimed not only five-twelfths of their annual expenditure upon coal, but also £300,000 (450,000 tons at 14s. 6d.) as a sort of extra provision. This was an amazing claim. They asked for five-twelfths of the £1,250,000 spent in the year upon coal, or half-a-million of money, and also for £300,000 for 450,000 tons more. These two sums of £500,000 and £300,000 constituted a claim that the tenant should have in hand in cash, on the day he entered into occupation, money for two-thirds of the whole supply he would require throughout the year; and they asked that upon this £800,000 they should be allowed 17½ per cent. for the year—an enormous figure. Mr. Littler, for a very obvious reason, desired to start his imaginary tenant at the month of October.

Mr. CASTLE: It does not matter when we start.

The CHAIRMAN: With regard to coal, I think it does.

Mr. LITTLER: I believe I can show your Lordship that it does not matter a bit. I took October quite accidentally.

The SOLICITOR-GENERAL: Taking the 1st of April, the stock of coal at that time was very small indeed—about 220,000 or 250,000 tons; but because on one occasion during a year the stock had been as much as 450,000 tons, the Company asked that this figure should be taken.

The CHAIRMAN: And they ask for 17½ per cent. in addition upon that outlay throughout the year.

The SOLICITOR-GENERAL: Yes. Having the 450,000 tons stored as a supplementary provision for their work, they ask for the money which this stock of coal lying there actually represents; and they claim that they are to have 10 per cent. for profit, 5 per cent. for interest, and 2½ per cent. for risks and casualties. The learned Counsel then proceeded to contend that the respondents had dealt with the Company with ample generosity. They had, he said, not only given 4½ months' coal expenditure, so as to bring them up to the time when the money for the gas sold would be coming in, but they had also allowed 150,000 tons in addition, in order to secure them against any risk. Coming to the 17½ per cent., he submitted that there never had been laid down any authoritative rule by which the Court had held itself bound to deal with all cases alike and in all circumstances. The Court had frequently allowed 17½ per cent.; and he agreed that this was a sort of traditional amount. But only a few days previously, he was quoting to the Court of Appeal a series of decisions in the Court of Chancery, beginning with the year 1869, coming on up to the present time, where it was well established that interest at 4 per cent. was usually allowed in lieu of the old rate of 5 per cent. It would be strange indeed if the Court did not take any account of modern facts and circumstances, and felt itself bound to a rate of interest which had become only one of the "pleasures of memory." Five per cent. interest upon money was not now obtainable. And, dealing with a concern like that of the Company, with all its monopolies and its means of getting in money, and with practically no bad debts, to suggest that it should be allowed to charge 5 per cent. for interest and 10 per cent. for tenant's profit was, he submitted, altogether extravagant.

The CHAIRMAN: They ask us to say that a hypothetical tenant—such a tenant as would be found for a property of this kind—would expect 17½ per cent. interest. Mr. Littler declares that a hypothetical tenant renting this property would look for that return upon his capital; and he makes the proposition in the face of the half-yearly accounts and returns, and also upon a comparison of the prices commanded by the shares of the Company on the Stock Exchange.

The SOLICITOR-GENERAL: That is so. And this is proposed to be granted to a tenant who is supposed to be carrying on such a business as this, who has already been allowed every conceivable expense. We accept Mr. Jones's figures for the increased cost of coal; and we allow 150,000 tons in addition to the 4½ months' expenditure. Where, in the name of Fortune, is there anything in the way of risk or casualty existing for which 2½ per cent. can be added on to the 15 per cent.? The question practically answers itself. I am quite content to feel that the whole matter is entirely within the cognizance and observation of the Court, and that this most important question will have full consideration given to it.

Friday and Saturday, Nov. 13 and 14, were occupied by the speech of Mr. Littler, on behalf of the appellants, and it was concluded last Wednesday, when Sir Peter Edlin announced that the Court would take time to consider their decision. A report of Mr. Littler's speech will appear next week.

CENTRAL CRIMINAL COURT.—Wednesday, Nov. 18.

(*Before Sir* THOMAS CHAMBERS, *Recorder.*)

The Alleged Attempt to Bribe the Salford Gas Engineer.

To-day, Mr. *Sydney Kershaw* surrendered to his bail to answer an indictment under the Public Bodies (Corrupt Practices) Act, 1889, charging him with having offered a gift to the Salford Corporation Gas Engineer (Mr. S. Y. Shoubridge) in order to induce him to advise his Committee to accept a certain tender for coal. It will be remembered that at the Quarter Sessions at Salford a true bill was found against Mr. Kershaw, and that the venue was transferred to London by order of the High Court. Defendant was first placed upon his trial on the 27th ult. (*ante*, p. 805), when the jury were unable to agree; and his bail was extended to the present sessions.

Mr. WADDY, Q.C., M.P., and Mr. COTTINGHAM appeared for the prosecution; Mr. W. BOWEN ROWLANDS, Q.C., M.P., and Mr. C. E. JONES for the defendant.

Mr. WADDY, in opening the case, gave an account of the events which led up to these proceedings, and which are well known to the readers of the JOURNAL. He explained that, under the recent statute, any person was guilty of a misdemeanour who corruptly offered to the servant of any corporation a gift or fee as an inducement or reward for doing or forbearing to do anything in respect of any matter or transaction, actual or proposed, in which such public body was concerned; and the question in this case was whether in what the defendant did he acted corruptly. Defendant had held contracts from the Salford Corporation in the time both of the present and late Gas Manager, and had been treated with the civility, courtesy, and kindness usually extended to contractors; but he was in exactly the same position as any other man. On April 22 last he went to the Gas Manager (Mr. Shoubridge), and told him he was going to again tender for coal. He then said: "I hope I shall get the contract;" and at the same time he produced an envelope, remarking, "I hope you will allow me to present you with this." Mr. Shoubridge indignantly refused to take it; and defendant was a little staggered, and tried to explain the matter away, saying, "I hope you don't think I meant that as a bribe; I only meant it for the various kindnesses you have shown me from time to time." Learned Counsel asked the jury, whether this excuse did not sound to them as men of the world as though it made the case far stronger than before. If the offer was intended merely as a reward, the offence would be just as bad. Mr. Waddy then read the letter written by the defendant to the Gas Committee, in which he asked that he should not be put on the Committee's bad books on account of what he admitted to be a foolish action.

The learned Counsel then proceeded to call evidence.

Mr. *Arthur Holmes*, Deputy Town Clerk of Salford, first produced the minutes of the Council bearing a record as to the appointment of Mr. Shoubridge as Gas Manager, and also the fiat of the Attorney-General authorizing this prosecution.

In cross-examination by Mr. ROWLANDS, witness declared that he did not know that the fiat of the Attorney-General was twice applied for without success; but he was told that, when the fiat was applied for, the Attorney-General requested that the opinion of Counsel on the subject should be laid before him before he granted the application. He had heard that the contract for coal used at the Salford Town Hall was let to Mr. Kershaw on June 13; but he could not speak definitely as to this.

Mr. *S. Y. Shoubridge*, examined by Mr. WADDY, said he had been for some time Gas Engineer to the Salford Corporation; and he remembered the defendant coming to his office on April 22. Up to that time he had not shown any special favours to the defendant as distinguished from any other person supplying coal to the Corporation; and until then the defendant had never offered any inducement to him, either by word or by letter, or in any shape or form, and had never intimated any intention of giving him a present. Witness having recounted what took place at the interview in question,

The RECORDER asked whether, in the course of the conversation, Mr. Kershaw said anything as to wishing to show his sense of the courtesy which witness had extended to him in the past.

Witness said that he did. Proceeding with his evidence, he stated that he communicated what had occurred to the Chairman of his Committee; and when Mr. Kershaw afterwards sent in a tender, he mentioned the matter to the Deputy-Chairman—the Chairman having in the meantime met with a serious accident.

In cross-examination, witness said that last winter was an exceedingly long and cold one; and on many occasions Mr. Kershaw had made applications to him for indulgence with respect to deliveries and in other ways, and these had been acceded to. There had been no difficulties with defendant's contracts; and he (witness) was on friendly terms with him. On May 1 a waggon of cannel was sent to him by Mr. Kershaw for testing; but he did not think he gave him authority to send it at the interview on April 22.

Mr. ROWLANDS: Until the learned Recorder interposed, you never told us, in regard to your conversation, that Kershaw said, "I merely wish to show you my appreciation of your courtesy and kindness in carrying out the contract?"

Witness: He did say that; but I had forgotten it for the moment.

Forgotten it! Don't you know that that was the position taken up by Mr. Kershaw at the last trial?—Yes.

And yet you had forgotten that material part?—For the moment.

In re-examination witness said that the testing of the coal was a private matter, and had nothing to do with the Corporation. He had nothing to do with the contract under which the defendant was now supplying coal to another department of the Corporation.

Mr. WADDY, in addressing the jury for the prosecution, remarked that the cannel coal which Mr. Shoubridge had tested for the defendant had nothing to do with the question to be considered by the jury. It was ridiculous to suppose that Mr. Kershaw when he offered something in an envelope to Mr. Shoubridge was making him a present because he had not pressed him for deliveries of coal that circumstances had rendered impossible. The only point made by the Counsel for the defence was based on the fact that the Corporation did not for weeks

after the attempt to bribe treat the defendant with contumely; but on the contrary, they continued on friendly terms with him. But after all, he (Mr. Waddy) could understand their conduct. The representatives of the Corporation were not in the position of private persons. They had the public interest to consider. It was necessary for them to act with due deliberation; and with respect to Mr. Shoubridge himself, his duty to the Corporation forbade him to divulge anything that the Gas Committee had on hand until that body gave him leave. It must be remembered, besides, that the defendant was a man with whom they had traded and been on friendly terms for a long time. It was therefore not unnatural that they should consider the subject carefully before making an accusation against him. The favours which the defendant alleged as his reason for offering a present were never referred to by him until he found what a mess he had got into; and his suggestion would not commend itself to twelve business men. Whatever the verdict of the jury might be, the Crown and the Salford Corporation would be satisfied. The latter were acting as a public body bound to see this case through to the end. He (Mr. Waddy) did not in the slightest degree desire to press the case unfavourably or harshly; but he wished the jury to see the facts in their simplicity and truth.

Mr. ROWLANDS, in addressing the jury on behalf of the defendant, remarked that the Salford Corporation had acted against his client with unnecessary severity. His tender for the contract was refused by the Gas Committee on most insufficient grounds. He had been subjected to the ignominy of two prosecutions under an Act of Parliament aimed against members of corporations wherein bribery was rampant and the public good lost sight of. This was the first prosecution under the measure; and he asked the jury to say that the case was not one that any corporation ought to have selected as a test case, and certainly not the Corporation whose conversion to the ways of virtue in this respect had been so rapid and so recent. It was not the first time that the case had been tried in that Court. It was argued at the last sessions before, he ventured to say, as competent a jury as the one he was now addressing; and the matter, which seemed to Mr. Waddy's mind too clear to admit of doubt, was in the view of that jury so far from clear that they did not believe that the prosecution had acquitted themselves of the burden lying on them. The case was accordingly discharged. The question to be decided was, What was the state of mind of Mr. Kershaw when he offered Mr. Shoubridge a present? Had he a corrupt intention? If he was simply offering a recognition of courtesies bestowed on him in the past, his intention was not corrupt. The way in which Mr. Shoubridge behaved at the time was the best proof that in his mind Mr. Kershaw's intention was not corrupt. He showed no sign of resentment; on the contrary, he parted from Mr. Kershaw in the most friendly way. He admitted that he had done a number of acts of kindness for Mr. Kershaw. Not only so, but he had devoted part of the valuable time of the Corporation to testing for the defendant two waggon-loads of a new cannel coal of which the defendant was contemplating a purchase. At the very moment of the interview at which the alleged offence was committed, the defendant showed that his intentions were perfectly upright, for he said, "I hope you are not offended; I never intended this as a bribe." If Mr. Shoubridge did not believe that statement, why did he a month later send Mr. Kershaw the following letter, dated May 21: "In reply to yours of the 16th inst., I am sorry I am not able to give you yet the information *re* the cannel, but will do so as soon after the holidays as possible. Your proposal as regards the method of tendering is quite satisfactory." Was that the language that one would address to a man whom one believed to have assailed the virtue and honour of an upright citizen? There was something behind this case; and there was something unexplained. He (Mr. Rowlands) contended that Mr. Kershaw's explanations ought to have satisfied the Corporation; and he appealed to the jury to restore the defendant to the position of honour and respectability which he had hitherto filled.

The RECORDER, in summing up, observed that it had been argued that whatever was offered by the defendant to Mr. Shoubridge was offered as a recognition of services rendered by the latter in the past. But it might be very possible for anyone to conclude that, even if past services were considered, the defendant had an eye as well to the future; and, if this was the case, the corrupt motive was present all the same. It was, in fact, a question of the motive entirely. The question was, Was the bribe offered with an improper motive? If the jury were not sure that there was such an improper motive, they should acquit the defendant; if, on the other hand, they were convinced that such a motive actuated the defendant, they should find him guilty.

The jury proceeded to consider the verdict; but, after a brief consultation, the Foreman said they were not agreed. They were ten against two. One of the jurymen remarked that the ten were for the defendant. The jury then retired to see if they could come to an agreement. After an absence of about three-quarters of an hour, they returned into Court and handed a paper to the Clerk, containing the following opinion: "The jury are of opinion that the contents of the envelope offered to Mr. Shoubridge by the defendant were in recognition of past kindnesses."

The RECORDER: Was the recognition of past kindnesses intended to influence him in any future thing he was about to do?

The FOREMAN: No.

The RECORDER: Then, as to the corrupt motive, you find he had no corrupt motive?

The FOREMAN: Quite so.

The defendant was then acquitted.

In connection with the reference made to the above case at the meeting of the Salford Town Council on the 30th ult. (see *ante*, p. 816), the following letter has been addressed to the Town Clerk by Mr. Kershaw's Solicitor (Mr. T. E. Jones): "Dear Sir,—My client has drawn my attention to certain remarks of Mr. Alderman Makinson, at the meeting of the Town Council on the 30th ult., which would seem to imply that the late abortive trial had resulted prejudicially to my client's character in his dealings with the Corporation. My client is personally obliged to M... ...derman Makinson for the evident kindness of purpose which prompted him to suggest the desirability of the Corporation withdrawing from the proceedings; but in justice to himself, he feels he must say that he altogether and absolutely repudiates the charge made against him, and as in the past he has courted the fullest investigation, he is not now prepared to accept any other position. The prosecution has, of course, affected him very seriously; but he has had no option but to meet the charge and give an absolute contradiction to any suggestion of intention to bribe or corrupt the Gas Engineer of the Corporation. You will observe that the next session of the Central Criminal Court is fixed for the 16th inst.; and I shall be glad to hear what arrangements you propose to make in respect of the hearing of the case before another jury."

Reduction in the Price of Gas at Newcastle.—The Directors of the Newcastle and Gateshead Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet for the current quarter. This will bring the price down to 1s. 10d., or, with the discount, 1s. 8d. per 1000 cubic feet. The last reduction was made at the annual meeting of the Company on Feb. 13, 1889, when 1d. was taken off the previous price, making the cost 2s. per 1000 feet, the usual discount being retained. The previous dividend was 9¼ per cent.; so that under the sliding scale, it will, in consequence of the present reduction, be raised to 9¾ per cent.

A Serious Fire caused by an Escape of Gas.—On Monday evening of last week, the large Cavalry Barracks at Canterbury were burned to the ground; and from an investigation which was made the following day, it appears that the fire was caused by an escape of gas from defective fittings in one of the rooms. The gas probably found its way through the ceiling into the space beneath the roof, which was used for the storeage, among other things, of Rangoon oil. Petroleum was also stored in the building; so that it is not surprising that the flames spread with great rapidity along the entire length of the structure. It is feared that the damage amounts to nearly £14,000; the stores having been of a very valuable character.

The Lighting of Courts in Birmingham—.A few days ago, at the Birmingham Police Court, the Stipendiary (Mr. T. M. Colmore) was engaged in hearing a number of objections of property-owners to the action of the Corporation with respect to the lighting of the courts in the city. On behalf of one of the property-owners, it was contended by Mr. G. Lee that the term "court" did not mean "street" within the meaning of the Act; and upon this point the Stipendiary gave it as his opinion that court did mean street, not in the popular acceptation of the word, but according to the interpretation of section 46 of the Birmingham Consolidation Act, 1883, and the Public Health Act, 1875, which Acts had to be read together. Furthermore, the proposed work was necessary; but as it was admitted that the Corporation had not legal power to compel the owner to supply light when proper means of lighting had been provided, he would include that question in a case if one were asked on the point of law. There was so much depending upon the decision of this point, that he would be pleased to have his ruling reviewed by a higher Court. The better plan would therefore be to allow the other cases to stand over for a week; and in the meantime Mr. Lee might decide to appeal or otherwise.

Huddersfield Corporation Gas and Water Supply.—In the course of his statement at the recent statutory meeting of the Huddersfield Town Council, the Mayor gave a few interesting particulars as to the working of the Gas and Water Departments during the past year. With regard to the gas undertaking, he said that the amount of coal and cannel used had been 46,471 tons, as against 44,030 tons in the previous year; showing an increase of 2441 tons. The gas sent out and consumed was 505,299,000 cubic feet, as compared with 483,018,000 feet in 1890; showing an increase of 22,281,000 cubic feet, or 4·61 per cent. The average illuminating power of the gas for the year was 19·84 candles, as compared with 20·15 candles in 1890. About 400 new consumers had been added during the year. A contract, he also mentioned, had been entered into with the Northern Counties Hydro-Oxygen Gas Company for the use of their patents for the manufacture of oil gas, which were expected to produce a rich and pure gas for the use of the consumers throughout the town and neighbourhood. With reference to the Water Department, the Mayor remarked that the population supplied with water in 1881 was 107,325, as compared with 139,145 at the present time; being an increase of 31,820, or 29 per cent. during the last ten years. The net income for water in 1881 was £27,191, as against a gross income of £50,969, estimated to produce a net income of £48,421 for the year 1891—showing an increase of 78 per cent. for the last ten years.

Alleged Contamination of the Rotherham Water Supply.—A special report has been presented to the Rawmarsh Local Board by the Medical Officer (Dr. Picken) on a sudden and serious outbreak of typhoid fever which has taken place in the parish. He says that his investigations lead him to suspect that the true cause of the epidemic is the contamination of the water supplied by the Rotherham Corporation; and this suspicion is strongly supported by evidence. According to his present knowledge, typhoid fever has only made its appearance within the last two or three weeks in localities where Rotherham water is consumed. On the occasion of a recent visit to the Ulley reservoir, he found the water in the reservoir muddy, and of deep yellow colour; showing how efficiently the surrounding land drained into it, and how difficult it would be for any typhoid germs that might be present to escape finding their way into the water. There were several ploughed fields near, one at least of which had been plentifully covered with stable and other manure five or six weeks previously. In other fields there were collections of manure, and in one heaps of night-soil. Two samples of water have been submitted to Mr. Alfred H. Allen, Borough Analyst of Sheffield for analysis, and his report states: "These results point to an infiltration of impurity of some kind, such as the drainage from cultivated land, or possibly from some more objectionable source." In conclusion, Dr. Picken says he feels it his duty to send a copy of his report to the Local Government Board and to the County Council. The Local Board have instructed their Clerk to write to the Rotherham Corporation, drawing attention to the existing state of things, and enclosing a copy of the Analyst's report.

MISCELLANEOUS NEWS.

ORIENTAL GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Wednesday, at the London Offices, 14, St. Mary Axe, E.C.—Mr. H. M'LAUCHLAN BACKLER in the chair.

The SECRETARY (Mr. J. G. Drew) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the year ending June 30, the main features of which were given in last week's issue (p. 907).

The CHAIRMAN said the report, as the shareholders would have observed, was eminently more satisfactory than the Directors had been in the habit of laying before them—in fact, they did not expect some months ago to be able to present a report such as the one he had now the pleasure of submitting. There had been a substantial increase in the revenue; and they had had an improvement in the value of coke, which had been partly secured by the shops they opened in Calcutta some little time ago. These had proved successful so far as they had enabled the Company to sell more coke than would otherwise have been the case. He would next refer to a subject which had caused the Directors the deepest regret—that was, the death of Mr. Alfred Hersee, who had been for upwards of thirty years the Secretary of the Company, and who, as the shareholders were aware, had devoted himself thoroughly to the duties which were entrusted to him. He was zealous to the very last; and he died suddenly one morning in the office adjoining the room in which they were then assembled. The Board considered that something more than a recognition of his services by the payment of the salary due to him should be made; and the report explained what they decided to do. They felt confident that they would have the sanction of the shareholders; and therefore they made an allowance to Mr. Hersee's widow of £100 per annum. He was sure that, in the sympathetic spirit which the shareholders had always shown in such matters, they would very gladly approve of the action of the Board, by adopting the report. The Directors had also lost one of their colleagues—Mr. Henry Solomon, who had been a member of the Board for six years. He was a regular attendant at the meetings of the Directors; and they found his long and large commercial experience of great value in their counsels. It had been necessary to make some changes owing to these circumstances. In Mr. Drew they had an efficient successor to Mr. Alfred Hersee. For many years, Mr. Drew had been an officer of the Company; and therefore he was well acquainted with the nature and details of his business, and they had found that he quite came up to their expectations when they made the appointment. With regard to the increase in business, the addition to the number of public lights had been satisfactory; the number of consumers had also been augmented; and they had laid a further 7 miles of pipes for the supply of public lamps. These extensions would bring them increased revenue in the future, as they had done during a portion of the past year. The railway siding mentioned in the report would be very beneficial to the Company. It would shortly be in operation; and they would derive from it not only a reduction in the cost of coal, which would be brought direct into the works, but there were sundry other ways in which it would prove an advantage. It would be a benefit in the carriage of residuals, and in the conveyance of materials from places with which the railway communicated. The total cost of the siding would be £3500; but he did not think this was at all expensive, considering the saving there would be when it came into operation. The Committee at Calcutta, and the Manager (Mr. D. C. Niven) had done all in their power to further the interests of the Company; and he thought the results achieved were such as to entitle them to the thanks of the shareholders, and the credit of having worked to the best advantage possible under the circumstances. The gas-rental for the year was £1616 more; and there had been an increase in the other receipts of £543. They would have had a greater advance in the rental than this, but last year they compared with a period when there were a considerable number of illuminations, and when, consequently, they had a larger demand for gas than similar circumstances had produced during the year under review. The electric light had not at present obtained much footing in Calcutta. Hooghly Bridge had been lighted for some time past, but, according to the accounts which the Directors had received, in a very unsatisfactory manner; and although they were threatened with the electric light in Calcutta, in face of such experience as this, and the great cost of the light compared with gas, the shareholders might be perfectly easy—at any rate at present—that it would not materially affect the Company's revenue. With reference to the sale of tar, this had not been quite so good; but, under the advice of Mr. Niven, the Directors were adopting such means as they thought wise in order to keep the whole of the tar business in their own hands. At present they were to some extent interfered with by competition from this country; and in order to put a stop to this, they would, he believed, succeed in measures which would be effective. As to the general position of the concern, he considered it was very good. They could declare a dividend of 10 per cent.; place £2000 to reserve; and have an increased balance of undivided profits of £3025. They had orders for additional public lights beyond those mentioned in the report, which would be productive from the time they were fixed. Owing to the railway siding, their coal supply would be cheaper; and the carriage of the products and other materials would be less costly. They had no labour troubles to fear in Calcutta, as most people had in this country and on the Continent; and therefore altogether he thought their position was a satisfactory one. Before concluding, he ought to say that, owing to the death of Mr. Solomon, it became necessary to fill up the vacancy on the Board; the minimum number of Directors being five. They did so by electing Mr. J. Blacket Gill, who was perfectly familiar to the shareholders, as an Auditor of the Company for some years. He was also the Chairman of the Commercial Gas Company; and so was well acquainted with gas affairs generally. The Chairman then moved—"That the report of the Directors and the statement of accounts be received and adopted."

Mr. C. HILL seconded the motion, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. H. L. HAMMACK, Mr. Edward Garey and Mr. Gill, the retiring Directors, were re-elected.

General TUPPER then moved, and Mr. E. F. WHITE seconded, a resolution re-appointing the Auditors (Mr. R. Hesketh Jones and Mr. A. T. Eastman); and it was carried.

A vote of thanks having been passed to the Calcutta Committee, the Manager, the Secretary, and the staff,

The CHAIRMAN remarked that there was another matter he wished the shareholders to consider. In one of the companies with which he was connected, it was noticed that the Directors and Auditors had—he believed ever since the income-tax was re-imposed—received their fees free of income-tax. That the staff should have done so by order of the Directors was quite right; but that the Directors and Auditors should have been paid their fees free of income-tax—the total remuneration being fixed by the shareholders—was not, it had appeared to some of their friends, quite regular. The present members of the Board had nothing to do with the institution of this custom; and therefore, as they wished to see it regularized, he asked the shareholders to pass the following resolution—"That the Board be authorized in the future as in the past to pay out of the funds of the Company the income-tax assessed on the Directors' and Auditors' allowances."

Mr. HAMMACK seconded the motion, and it was carried.

Mr. GILL said that, as this was the first time he had had the pleasure of meeting the shareholders as a Director, he wished to thank them for re-electing him to the Board. He had attained this position with feelings of great pleasure, as his father and the father of Mr. Hammack were among the original Directors of the Company.

A vote of thanks was passed to the Chairman and Directors, on the motion of Mr. R. HESKETH JONES, seconded by Mr. E. F. WHITE.

The CHAIRMAN having acknowledged it,

Mr. DREW said he desired to thank the shareholders for the vote of thanks which they had passed to the Calcutta Committee and to the officials. For nearly 20 years, he added, he had been book-keeper to the late Secretary; and so he was well acquainted with the work of the Company. He could assure them that, in his more responsible position, the interest of the shareholders would be closely studied.

The proceedings then terminated.

GENERAL GAS COMPANY OF FRANCE.

According to the report presented by the Directors of this Company at the recent annual general meeting, the working in the twelve months ending June 30 last was marked by a further rise in the price of coal. Owing, however, to a better utilization of the residual products, to the exercise of greater economy in the manufacturing operations, and to the development of the consumption of gas, the results laid before the proprietors were substantially the same as those presented to them at the close of the preceding twelve months. Consequently, the Directors found themselves in a position to propose a similar rate of dividend to the last, without reducing the amounts usually allocated to the revenue and sinking funds. At the end of the past financial year, the Company's invested capital amounted to 36,022,673 frs., of which 13,841,538 frs. had been spent on works, and 22,181,135 frs. in the purchase of shares in various gas undertakings. At the corresponding period in 1890, the total was 35,861,721 frs. The amount of profit realized by the various investments of the Company last year was 2,818,147 frs. being an increase of 106,136 frs. on the figures for 1889-90. Adding the balance brought forward, there was produced a sum of 2,932,516 rs. After deducting the general expenses, interest, additions to the sinking and reserve funds, Directors' fees, and other charges, there remained 472,155 frs. available for distribution. From this, it was proposed to take 250,000 frs. for the payment of dividend; leaving a disposable balance of 222,155 frs. Of this sum 100,000 frs. were to go to the reserved profits, and 122,155 frs. to be carried forward. At the close of the year, the total amount of the reserve and sinking funds, with the balance carried forward, showed an increase of 459,169 frs. as compared with the position on June 30, 1890. The dividend recommended by the Directors was, as before, 31 frs. 25 c. per share, of which 10 frs. had been paid in the interim; so that there would be 21 frs. 25c. per share to come to the proprietors. This was unanimously agreed to. The General Manager of the Company is M. Albert Ellissen.

LEICESTER CORPORATION GAS UNDERTAKING.

Local Government Board Inquiry.

Colonel Hasted, R.E., one of the Local Government Board's Inspectors, held a public inquiry at Leicester last Friday week, in reference to the application of the Corporation for sanction to borrow £50,000 for the purposes of the gas undertaking. The Town Clerk (Mr. J. Storey) addressed the Inspector in support of the application. He mentioned that the Corporation were authorized by Act of Parliament to borrow £100,000, provided the Local Government Board were satisfied as to the necessity for it. The present application was for £50,000, the first instalment of the amount. It was true that the Corporation had already exceeded their borrowing powers; but he thought the Inspector would agree with him that the anticipating of the Government Departments was not one of the faults of the Corporation, and that the exceeding of their borrowing powers in this instance could be satisfactorily explained. A large amount of the excess was caused by the purchase of property in Millstone Lane, which was a very desirable acquisition. The only means of paying for this was by finding the money in some temporary manner. It was supplied by the bank, and was a part of the £17,000 which had been overdrawn. As to the sum of £50,000 which they now wished to borrow, he said that necessity for considerable expenditure might arise at any time, as new districts were frequently being opened up. Mr. Alfred Colson, the Engineer and Manager of the Gas-Works, gave evidence in support of the application. He considered the money was urgently required for the ordinary extension of the

undertaking. The money was wanted for the following purposes: Overdraft on capital account, £17,766; completing work now in hand, £5000; new mains, services, and meters, £4000 a year, or £12,000 in three years; and £15,233, the balance for extending the carbonizing plant in the retort-houses and other works from time to time during the next three years. The whole of the expenditure would be for works of a permanent character. The Town Clerk afterwards stated that the £50,000 asked for was calculated to last for three years; and at the end of that period the Corporation would probably apply for sanction to borrow the second instalment of the £100,000. Alderman Lennard also addressed the Inspector, and the inquiry then terminated.

THE ELECTRIC LIGHTING SCHEME FOR ST. PANCRAS.

At the Meeting of the London County Council last Tuesday, the Finance Committee reported with regard to an application from the St. Pancras Vestry for a loan of £60,000 for carrying out their scheme of electric lighting, particulars as to which have already been given in the JOURNAL. The total cost of the works is estimated at £63,000; and the Vestry asked that the proposed loan should be repayable in 42 years. With regard to the period over which the loan should be spread, the Committee said the Council were precluded from making advances to vestries for works other than street improvements and bridges for more than 30 years; and as the engines, boilers, dynamos, batteries, &c., in connection with the scheme, could not be expected to last for more than half that period, they were of opinion that the usual course should be adopted—viz., to limit the period of repayment to the assumed life of the respective works—although they considered that, the works being expensive and unremunerative at the outset, the repayment might be deferred for a period of two years. Taking the total cost as the basis of the application for the loan, they recommended that the application should be granted to the extent of £56,300, at 3¼ per cent. —the principal being repaid by annual instalments, commencing Oct., 1894, as to £32,400 within a period of 30 years, as to £20,800 within 15 years, as to £2700 within eight years, and as to £400 within five years from the date of the advance of the loan. Lord Lingen (Chairman of the Committee) moved that the report be referred back to the Committee. Mr. Eccleston Gibb (who is the Vestry Clerk of St. Pancras) said the matter was one of very great importance to the applicants; and the policy of not lending the money for 42 years would have the effect of altogether putting an end to the work. He understood the only point to be reconsidered was whether the portion of the resolution was to be withdrawn which allowed the Vestry two years before they commenced to repay the loan. This only made the proposition worse than it stood upon the paper. If the Council felt it impossible to lend the money on the terms asked, it would be necessary for the Vestry to go to Parliament for power to borrow. If what the Vestry asked for were not done, there would be an end to the proposal, because it would mean that the cost of electricity would be greatly increased, and either the consumers would have to pay very heavily for it, or the balance would have to be put upon the ratepayers who were not consumers. Mr. Wetenhall remarked that there was already a greater demand for the electric light than the Vestry could supply; and if anything were done to prevent the carrying out of the work, it would be a very serious matter. There had been a great deal of opposition to the scheme of the Vestry; but notwithstanding this, the undertaking was likely to be one of the greatest successes in the Metropolis. Mr. Westacott sincerely hoped the electric lighting work would be carried out. The Council had, he said, again and again protested against the monopolies of the Gas and Water Companies, and regretted the heavy expense that would have to be incurred in the event of their being bought up. St. Pancras had decided to get rid of the monopoly in the matter of electric lighting by taking it up themselves; and he thought they should be assisted. He suggested that the Parliamentary Committee should be asked to insert a notice in their General Purposes Bill with the object of extending the time for repayment. After some further discussion, the motion was agreed to; Mr. Gibb stating that the Vestry would give proper parliamentary notice.

THE PROPOSED ELECTRIC LIGHTING SCHEME FOR FINCHLEY.

In the JOURNAL a fortnight ago, it was stated that the Finchley Local Board had decided to apply for a Provisional Order to enable them to carry out a scheme of electric lighting in their district, at an estimated cost of £17,000. This step was taken on a report presented to them on the subject by their Engineer and Surveyor (Mr. F. Smythe), who suggested the adoption of the alternate-current transformer system as being the most suitable for a scattered district like that under the Board's control. We have received a copy of the report, which was prepared some time ago, and take therefrom the following particulars: With regard to the kind of lighting to be adopted, Mr. Smythe considers that an expert would advise a combination of the arc and incandescent systems; the latter, when used alone, having, he says, turned out to be a failure. He gives three reasons for this: (1) The overrating of the illuminating power of the lamps; (2) the false ideas entertained by the public as to the brilliancy of the electric light, and the disappointment resulting therefrom; (3) the want of diffusiveness in the rays from an outdoor incandescent electric lamp, as compared with those from a gas-light. Taking these things into consideration, he thinks it is always advisable to employ a higher-power light when electric lighting is being substituted for gas. Coming to the practical portion of the report, it appears that there are 408 gas-lamps in the district, the cost of which, in the financial year ending March 25, 1890, was £2 os. 6d. per lamp, or a total of £826 14s. Mr. Smythe estimates that the plant and incidental outlay attending an installation of 32-candle power incandescent lamps in place of the present gas-lights would come to £14,000; and that the annual cost for repayment of loan, interest, and working expenses would be £1251 5s., or £3 1s. 4d. per lamp—an excess of £1 os. 10d. over the cost of gas. He points out, however, that at present the gas-lamps are only lighted for eight months in the year, and then only until midnight; and as he says they will no doubt soon have to be kept alight throughout the night all the year round, this will mean a further cost of 9s. 6d. per lamp, but only about half this sum for the electric light. With regard to private lighting, Mr. Smythe has ascertained that the occupants of houses assessed at £30 and upwards employ 7219 gas-jets, and that there are 2240 jets in use in churches, schools, and public places; and so he reckons that 3000 lights will require to be provided for in the installation of 8-candle incandescent lamps for the lighting of interiors. The cost of the plant for supplying these and the 32-candle public lamps combined would be £19,000; and the annual charges, £2500. He estimates the total receipts, at 6d. per Board of Trade unit (or equal, as he puts it, to local gas at 3s. 6d. per 1000 cubic feet), at £2920. Deducting £920 for depreciation, there is left an annual revenue o £2000—a difference of £500, which would be the cost of lighting the public lamps.

ELECTRIC LIGHTING FOR COVENTRY.

Mr. A. Bromley Holmes, the Electrical Engineer who advised the Coventry Corporation in the promotion of their Electric Lighting Order, has lately submitted to the Electric Light Committee a report in which he deals with the questions as to whether it is more advantageous for the Corporation to carry out the lighting themselves or to transfer the Order to a company, and as to the best system to be employed. In considering the first matter, he says that a corporation have several marked advantages in undertaking the supply of electricity themselves—(1) They can borrow money at a lower rate of interest than is practicable for a company to do. (2) The costs of administration are less, being limited simply to the costs of the actual work to be performed. (3) The breaking up of the streets is kept entirely within the corporation control, and can be more economically conducted, and with greater regard to public convenience. For these and similar reasons, a corporation can, says Mr. Holmes, supply electricity at lower rates than it is possible for a company to do. For example, assuming 8d. per unit to be a fair price for a company to charge in a given locality, he estimates that a corporation would be able to work at a profit of 7d. per unit—thus affording a material advantage in price to the public. Mr. Holmes thinks it is certain in the future that improvements in incandescent lamps and a reduction in the price will gradually reduce the cost of electric light till it is no dearer than gas is at present. In his opinion, too, at equal prices, the electric light would largely take the place of gas for lighting purposes; and it would therefore not be wise for a corporation owning gas-works to allow the competing illuminant to be in the hands of an outside company. On the other hand, although electrical machinery has been brought to a high state of efficiency, it is possible that in the future some more direct method of producing electricity than by means of the steam-engine and dynamo may be discovered, in which case there would be serious depreciation of the capital expended in electric light works. As to the best system to be employed, Mr. Holmes remarked that he has no hesitation in recommending a low-tension direct-current system of supply, with underground mains. In the first instance, a station might be equipped with plant, for (say) 5000 16-candle power lamps. A station of this output is large enough to be worked with economy; and the buildings would be so designed as to be capable of gradual extension as the demand for the light increases. The streets in which it is obligatory to lay mains for general supply within two years are about 2000 yards in length; and there is no difficulty in arranging for the supply of current to arc lamps for lighting these streets from the same mains. He estimates the cost of a station of the size recommended—comprising plant, building, mains, and accessories of all descriptions, including the arc lighting of the compulsory streets—at £32,000. The Electric Lighting Committee were of opinion that this report did not answer the questions they intended to put to Mr. Holmes; and they requested him to reconsider the following points: (1) As to the best system to be employed, bearing in mind that the Committee look much more to private lighting than to the lighting of the streets; and (2) As to the suggested possibility of some more direct method of producing electricity than by means of the engine and dynamo being discovered. In the course of his reply, Mr. Holmes says that the low-tension direct-current system which he recommends is particularly suitable for the supply of electricity to private consumers; but at the same time there is no difficulty in arranging for the supply of current from the same mains to arc lamps, if it is decided to light the streets. At the present time, he adds, the steam-engine and dynamo are the simplest and cheapest means of producing electricity; and the efficiency of the electrical portion of the plant is very high. Any more direct method of turning heat into light is simply amongst the scientific possibilities of the future, and no material progress has as yet been made in that direction. At the last meeting of the City Council, it was decided to defer the further consideration of the electric light question till the first meeting of the Council in February.

Florence Water Supply.—The water supply of Florence has just been the subject of investigation by Sir Douglas Galton, K.C.B., F.R.S., who had been commissioned by the municipal authorities of the city to report thereon; and he recently visited all the public water-works. On Monday last week his proposals came before the Municipal Council; and it was decided to carry out works which will considerably increase the supply of good drinking water.

The South Normanton, Blackwell, and Hucknall-under-Huthwaite Gas Company, Limited, has been registered with a capital of £15,000, in £5 shares, to acquire the undertakings of the South Normanton and Blackwell Gas and Water Company, Limited, and the Hucknall-under-Huthwaite Gaslight and Coke Company, Limited, and generally to carry on the business of a gas company in all its branches, and also that of producers and distributors of electricity, in the townships of South Normanton and Blackwell, in Derbyshire, and Hucknall-under-Huthwaite in Nottinghamshire, or elsewhere.

METROPOLIS WATER SUPPLY.

Projected Water Legislation of the Corporation and the County Council.

Last Friday the London newspapers contained a notice, issued jointly by the Corporation and the County Council, of their intention to apply to Parliament next session for certain powers with respect to the water supply of the Metropolis. This action is in pursuance of the arrangement lately come to by these two bodies, as already recorded in the JOURNAL; and the extent of the powers sought by them will be seen from the following outline of the Bill they are about to promote:—Parliament is to be asked to authorize the formation of a Water Committee, to consist of members appointed by the Corporation and the Council; and to confer upon the latter body power to promote Bills in Parliament for any of the following objects: "(1) To acquire, construct, and maintain water-works, aqueducts, wells, reservoirs, and other works, and do any necessary acts in connection therewith, to afford a new or supplemental water supply. (2) To acquire or take on lease any existing or future water-works, or the undertaking of any Water Company, or any part thereof, or any interest therein, or any water or right to take or convey water. (3) To provide for the dissolution and winding up of any Water Company whose undertaking shall be acquired by the Council, and for the adjustment of any interest in any such undertaking which shall have been partially so acquired; and generally for all purposes connected with such acquisition—including superannuations, allowances, or gratuities to officers and servants of such Companies. (4) To sell, lease, or dispose of any such undertaking, or portion thereof, or works, rights, or interest at any time vested in the London County Council. (5) To make provisions for the raising of such moneys as may be required for the purpose of carrying into effect the provisions of the intended Act, or any Act of Parliament promoted or obtained by the Council in pursuance of the intended Act. (6) To supply the inhabitants, or any county or local authority, or corporation, within such area, and on such terms as Parliament shall from time to time authorize or direct, with water by meter or otherwise, for all public and private purposes. (7) To carry on, consolidate, enlarge, and improve such undertakings as the Council may, by authority of Parliament, acquire or construct, or to regulate and control the Water Companies and their undertakings. (8) To obtain such further powers as they may deem expedient for giving effect to the objects of the intended Act or any such Bill." It is proposed to ask for the Water Committee to be formed under the provisions of the Act, the following powers: "(*a*) To make and enforce regulations for prescribing the strength, character, weight, and materials of fittings and appliances to be used for preventing the waste, misuse, and undue consumption of water, and otherwise in relation thereto. (*b*) To make any public or private inquiry into the existing supply of water within the Metropolitan water area, and the charges made for the same, and into the possible future sources of such supply; and to enter into negotiations with any public authority, or water company, or persons for the acquisition or taking on lease of any of their powers or undertakings, or any part thereof, and (subject to ratification by the Council) to enter into and carry into effect contracts in respect thereto; also to confer on the Council power to delegate to such Committee certain administrative powers for carrying on the supply of water which may be conferred on the Council by the intended Act." General powers will be asked for the Council and the proposed Committee to enter upon the lands and works of any Water Company, and inspect them and the plant therein, and to require the production of books, documents, and accounts; also for the Committee to provide and maintain offices, and appoint and pay officers and servants; and to provide for the payment of costs, charges, and expenses, as payments for general county purposes, out of the county rate.

In a General Powers Bill of which the London County Council have given notice, they ask for authority with respect to the conduct of inquiries and nogotiations relating to the supply of water in the Administrative County of London and in neighbouring counties, or to any company having powers of such supply, or to any of the undertakings of any such company, and to make provision as to the payment of the costs and expenses incident thereto. They also seek power to defray, out of the county fund or otherwise, the cost, or a portion thereof, of any Bill promoted by them in conjunction with the Corporation of London with reference to the supply of water in London or the neighbourhood; and likewise to promote on their own account any Bill or Bills in respect of such supply, and charge the expense upon the county fund or rate.

The London Local Authorities and the Expenses of the Metropolis Water Supply Bill.

In a paragraph in a recent number of the JOURNAL, we recorded the fact that the Clerkenwell Vestry had declined to contribute anything in liquidation of the deficit still outstanding—£1392—in connection with the promotion of the Metropolis Water Supply Bill of the past session. The Holborn District Board of Works lately received a touching appeal from the Executive Committee of the Associated Vestries for a further contribution from them; but the matter was simply allowed to drop. Last week the Mile End Old Town Vestry had the question before them; but the Finance Committee recommended that there should be no contribution from the Vestry, and this was agreed to. At the meeting of the Vestry of St. Margaret's and St. John's, Westminster, the Finance Committee reported that, inasmuch as the Vestry were represented at the water conference, when it was decided to promote the Bill, they recommend that £75 be subscribed by the Vestry towards the deficiency. After a good deal of debate, the motion was lost by 5 votes to 32. At the meeting of the St. James's Vestry on Thursday, the Finance Committee recommended—"That a further sum, not exceeding £100, be contributed towards the expenses incurred by the Executive Committee of Vestries on the London Water Supply, such sum to be the final contribution of the Vestry in the matter; that payment be withheld until the Vestry's representative on the Committee shall direct; and that, in the event of it appearing probable that the present deficit will, wholly or in part, be made up, such contribution be not paid or be diminished, as the case may be." The recommendation gave rise to a long debate; but eventually it was adopted. This will make a total of £400 contributed by the Vestry towards the expenses connected with the promotion of the Water Bill.

The Quality of the Water in October.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 179,951,481 gallons, as compared with 177,723,730 gallons in the corresponding month of 1890; being at the rate of 29·6 gallons per head of the population. Of the entire bulk of water sent out, 91,328,241 gallons were drawn from the Thames, and 88,623,240 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·7; East London (deep-well), 1·0; Colne Valley, and Tottenham, 1·6; New River, 2·1; Chelsea, 4·2; East London (river supply), 5·3; Grand Junction, 7·0; West Middlesex, 7·9; Southwark, 8·5; and Lambeth, 8·8. The water abstracted from the Thames by all the Companies, except the Chelsea, was very seriously affected by heavy floods. It was brownish in colour; and the organic matter in solution, although chiefly of vegetable origin, had been increased in amount to a very objectionable extent. It is evident that these Companies, with their present limited storeage, are unable to avoid the delivery of polluted flood water. Efficient filtration had, however, been carried out in every case. The water taken chiefly from the Lea by the New River Company was only slightly affected; but that derived from the same source lower down the stream by the East London Company contained considerably more dissolved organic matter than the Thames water of the Chelsea Company, although much less than that supplied by the other Thames Companies. Both waters were efficiently filtered before delivery. The deep-well waters of the Kent, Colne Valley, and East London Companies, and the Tottenham Local Board of Health, were unaffected by the floods. They maintained their excellent quality for dietetic use; and the Colne Valley Company's water, having been softened before delivery, was rendered suitable for washing. All these waters were clear and bright without filtration. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, and East London (deep-well) waters, were clear and colourless; the New River, clear and nearly colourless; the Chelsea, clear and pale yellow; the East London (river supply), clear and yellow; and the remaining waters, clear and light brown. The bacteriological examination by Dr. Koch's process of gelatine plate culture gave the following results: One cubic centimetre of each water, collected on the same days as the samples for chemical analysis, developed the following numbers of colonies of microbes: New River, 22; West Middlesex, 42; East London (river water), 56; Southwark, 58; Kent, 81; Chelsea, 86; Lambeth, 94; and Grand Junction, 98."

The Electric Lighting at Larne.—Owing to the failure of the contractors for the electric lighting of Larne to complete their work by the time fixed, the Gas Company's services have been called in, and, for the next few weeks, certain thoroughfares will be lighted by gas—to the convenience of the inhabitants, and at the cost of the contractors.

Calcutta Water Supply.—With regard to the water supply of the city of Calcutta, *Indian Engineering* says that the length of mains and services on the filtered system is 231·45 miles (including 70·67 miles in the added area), of which 47·14 miles were laid during the past year. The length of the unfiltered system is 66·25 miles. The average supply per day of filtered water last year was 17,182,383 gallons; and unfiltered water, 3,507,095 gallons. This gives 39·46 gallons of filtered water per head per day for the town proper, and 15 gallons per head per day for the added area. The number of premises connected with the mains for the filtered water service in the town and added area combined was 19,850, of which 657 were served during the year.

The Competition of Gas and Electricity on the Continent.—A short time ago a concession for supplying the electric light in Sedan was granted by the Municipality of that town to MM. Colette and Fédrick; and thereupon proceedings were taken by the local Gas Company for breach of contract. One of the articles of the concession specified that "if by reason of the progress of science or discovery, any new mode of lighting whatsoever shall have been adopted for at least two years in towns of the same importance as Sedan, before the expiration of the present agreement, the Municipality reserves to itself the right of annulling this agreement without compensation, in order to give the town the advantage of the new mode of lighting," and the Municipality contended that this clause did not apply to private lighting, and that therefore their action was justifiable. The matter came before the Prefectoral Council of the Ardennes, who decided in the Company's favour, and condemned the Municipality to pay 14,000 frs. damages and costs.

Proposed Acquisition by the Belper Local Board of the Water-Works.—At the last meeting of the Belper Local Board, a communication was received from the Secretary of the Water Company, saying it was their intention to apply for power to borrow a sum of £4000 for improving the plant. In consequence of this, a meeting of the ratepayers was convened last Wednesday, to consider the advisability of purchasing the works. There was some opposition to the proposal, as a large number of houses are supplied with water free of cost. It was stated, but not officially, that the Company had declined to proceed with the application. A resolution was proposed to the effect that the meeting considered the present supply of water for the town was thoroughly inadequate, and was strongly opposed to the sanction of the Local Board being given to any addition to the capital of the Water Company. This was seconded, and carried by a large majority. Another resolution was passed requesting the Local Board to acquire the water-works at a fair valuation, and to provide a proper supply of water for the town.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

In the death of Mr. J. K. Watson, the late Treasurer and Manager of the Edinburgh Gas Company, there has passed away one who, if not a pioneer of the gas industry in Scotland, did in his day as much to advance and consolidate it as anyone who has been connected with it in these northern parts. At the time Mr. Watson came to have a voice in the management of the Edinburgh Gas Company, the industry had got over its initiatory struggles, and was ready to enter upon the marvellous period of prosperity which it has since experienced. Mr. Watson was a shrewd man, and was devoted to his work, taking interest in hardly anything else; and the result of his labours was the building up of the most successful Gas Company, in Scotland at least. Not only during the existence of the Company did his clear head and his iron will bring prosperity to it, but the manner of its going out of existence is currently believed to be the result of his skilful engineering. I have heard it frequently asserted, and I confess that I share the opinion myself, that his Bill of 1887—in which he proposed to adopt the sliding scale with an initial price of 3s. 6d. per 1000 cubic feet of gas, and a dividend of 10 per cent.—was intended to frighten the Corporation into a transfer. Whether that was his intention or not, it had that effect; and the Company secured terms which have not been equalled by any other Gas Company on being taken over by a Municipality. Such a man was worth having in the employ of any gas company; and he well deserved his pension of £1300 a year, which was his full salary. The pity is that he has not lived longer to enjoy it and the retirement which he so well earned. Mr. Watson was essentially a gas man. Many a gas company, and many a gas manager in Scotland, benefited by his advice. Though the Edinburgh Gas Company had his first consideration, he was ever ready to give assistance to others in the same line as himself. He has probably outlived most of those whom he thus helped; but a generation ago he was respected and admired in gas circles in Scotland, and was the recognized authority on all matters connected with the financing of new works or the extension of existing ones. And for that office he was the better fitted, in that he had an intimate knowledge of the technical side of the industry as well as the financial. This is another name added to the list of illustrious men who have been produced by the gas industry in its short history of less than a century.

It is a recognized experience that gentlemen who are desirous to serve in any public capacity frequently have difficulty in attaining their object; it is seldom that there is any trouble in retiring from such a position. Yet that would seem to be the situation in which Mr. Mitchell Thomson is placed with reference to the Edinburgh and Leith Gas Commission. Mr. Thomson intimated at last Tuesday's meeting of the Edinburgh Town Council that he had sent letters stating that he wished to resign the office of Commissioner to both the Clerk to the Gas Commission and to the Town Clerk; but both had refused to accept his resignation, each having referred him to the other. Mr. James Robertson said he intended to resign also; and the Lord Provost recommended him to notify both the Clerks, as Mr. Thomson had done, Now the Lord Provost was wrong. It is the Corporations who elect the Gas Commissioners; and it is to their respective Corporations that, in the absence of any direction upon the subject in the Act of Parliament, resignations should be sent. The Town Clerk would then notify the Clerk to the Gas Commission that a resignation had been sent to him, and the election of a new Commissioner when that event should take plaee.

There is nothing like a statement in public for dispelling the dense ignorance, or something worse, which exists even in the minds of some public men. Such a statement was made in the Aberdeen Town Council on Monday by the Lord Provost, in vindication of Bailie M'Kenzie, the Convener of the Corporation Gas Committee. The Council were engaged in the re-construction of committees after the elections; and on its being proposed that Bailie M'Kenzie should be re-elected Convener of the Gas Committee, Mr. Sinclair objected on the grounds that it was not a wise thing that a coal merchant should occupy such a position, and that there was a feeling in the community that Bailie M'Kenzie had supplied bad coal to the gas-works. The Lord Provost effectually dispelled the delusion by explaining that Bailie M'Kenzie had never, either directly or indirectly, supplied any coal to the gas-works; and that the bad coal that had been so often referred to, was got at a time when Aberdeen was likely to be left in darkness for want of coal owing to a strike. It would therefore have made no difference who was Convener of the Gas Committee. This was sufficient, and Bailie M'Kenzie was re-elected.

A salutary lesson is read to all who are either careless or criminal, by a case which was heard by Sheriff Brown at Aberdeen yesterday. Complaint was made on behalf of the Peterhead Gas Commissioners that Alex. Fettes a plumber, had been guilty of a violation of the gas statutes by burning gas belonging to the Gas Commissioners without a meter, from the 20th to the 23rd of October. The charge was admitted so far as the latter date was concerned; and the Solicitor who appeared for the Gas Commissioners agreed to restrict the complaint to that day. Then the Solicitor for the accused made the customary exculpatory plea. The man, he said, had a meter for his shop; but when some alterations were being made upon adjoining property, he openly continued a service-pipe which communicated with the gas-main to a smithy at the back of his premises. The smithy was not used during the time mentioned, the plumber and all his men being at work elsewhere; but a boy who had occasion to go into the smithy, connected this pipe with a gas-burner by means of an india-rubber tube, thinking that the gas came through the meter in the usual way. Fettes had no knowledge that this was going on; but as soon as he heard of it, he sent to the Gas Commissioners and offered to pay whatever they chose to charge for the gas consumed. The prosecuting Solicitor did not admit this explanation; and he pointed out that by limiting the complaint to one day, he had restricted the maximum penalty to £7. The Sheriff, addressing the accused, said the application was an unusual one; but he felt he would be wanting in his duty if he did not administer the law in such a manner as would afford the Commissioners protection from such practices. He would modify the penalty to a fine of £3, as the strict statutory penalty, with £2 for the day libelled; or, failing recovery in the manner provided for by the Act, alternatively imprisonment for 14 days.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

In speaking of the municipal honours conferred at this time of year on persons connected with the gas industry, it would be quite an oversight to omit to refer to the gentleman who has quite recently demitted the duties of President of the North British Association of Gas Managers—namely, Mr. Robertson, the Manager of the Bathgate Gas-Works. When the Burgh Commissioners of Bathgate held their meeting to fill up the posts of honour and special duty, considerable prominence was given to Mr. Robertson. Mr. Waddell proposed him for re-election to the post of First Bailie or Senior Magistrate; and in doing so, he specially noted the fact that Mr. Robertson had now served the Burgh of Bathgate for the long period of nearly twenty years, and that during that time he had on several occasions been returned at the head of the poll. Mr. Robertson's re-election was unanimously agreed to. The same gentleman was also re-elected Dean of Guild, in which capacity he has to hold a Court periodically to adjudicate on the plans for proposed new buildings within the Burgh. Being a practical man and well skilled in financial matters, he was afterwards elected a member of the Water and Finance Committees of the Board of Commissioners. His many friends in the gas profession will doubtless be glad to learn that Bailie and Dean of Guild Robertson is held in such high regard by his fellow-townsmen.

Last night, in the middle ward of Falkirk, there was a friendly conference of a large body of electors with three representatives, one of whom is the Provost of the Burgh. One of the subjects discussed was the "gas question." The holding of this meeting for friendly conference seems to indicate that the electors intend to keep their representatives in the Town Council up to the mark. It may be, however, that the ultimate aim of such meetings is, among other things' to impress upon the Town Council the desirability of opening, or rather of renewing, negotiations with the Gas Company for the acquisition of the gas supply undertaking of the town. If anything is to be done in this direction, it is to be hoped that it will not lead to such an hopeless muddle as the Falkirk and Larbert Water Trustees have got into, and from which there seems no hope of immediate extrication. While the grumbling against the Falkirk Joint Stock Gas Company goes on, it is evident that the Company's property is being rated at a high value, for this week 23 shares have been disposed of for £61 4s. 9d.

At the usual monthly meeting of the Dumbarton Town Council, held on Wednesday night—Provost Babtie in the chair—it was reported that the Gas Corporation had paid off a bond of £4000, and that there was still £2000 in hand.

I have just been informed that the Glasgow Corporation Gas Committee expect that there will be required during the month of December at the various gas-works—now six in number—belonging to the Corporation, something like 70,000 tons of coal; but where the material is to come from is at present a matter of very great concern to the Committee, the fact being that a number of the contracting coal merchants and colliery owners have failed to "come up to time." So far as the season has already gone, there has been an unusually large consumption of gas. There is on record one period of 24 hours during which the consumption rose to upwards of 22 million cubic feet. The productive capacity of the various works may not in any way be in danger at present; but if two or three decidedly foggy days should occur between now and the end of the year, there is a moral certainty that the holder capacity will be seriously tested. It is to be hoped that it will not fail.

While dealing with Glasgow gas affairs, I may mention that Mr. Wilson, the Manager of the Dawsholm gas-works, has been charged with the management of the Temple Farm works, which latterly belonged to the Partick, Hillhead, and Maryhill Gas Company, and over which the presiding spirit was Mr. L. Monk, who for the present has retired to Peebles to enjoy a bit of country life. I understand that Mr. Wilson also takes managerial charge of the gas-works at Old Kilpatrick, which passed about eighteen months since into the hands of the Gas Company just named.

The Glasgow pig iron warrant market has been quiet this week. In Scotch warrants no business has been reported; but at the close yesterday there were buyers offering 47s. 6d. per ton cash, sellers holding out firmly for 48s. per ton. In hematite and Cleveland warrants rather a larger business has been done at somewhat lower prices. The closing quotations yesterday afternoon were, respectively, 48s. 2d. and 38s. 6½d. per ton. There is no new feature in the general position of the market.

There is a less favourable report of the Glasgow coal trade this week; the reductions in price intimated at Newcastle and Bristol having caused much business to migrate to these ports. Then, again, there is a disposition among buyers, with the knowledge that the output is less pressing, to hold off, while the hardening in freights has also tended to aggravate the position from the master's point of view. House coal does not advance in price as might have been expected; the announcement of a reduction in the North of England having rather checked business here. Best ell coal has been given at 9s. per ton f.o.b.; and steam sorts have also gone lower. Main has remained steady at 8s. per ton. The bright spot has been the increasing inquiry for splint for the iron and steel works; and 9s. 3d. per ton has been obtainable all the week.

Extension of the Malvern Water-Works.—At a special meeting of the Malvern Local Board last Thursday, the tender of Mr. Alexander Gall, of Alloa, for the construction of a reservoir, conduits, catchwaters, &c., for £34,020was accepted.

Extension of the Newcastle Gas Company's Works.—In connection with the Redheugh works of the Newcastle and Gateshead Gas Company, there is at present in course of erection an additional section of retorts, and further purifying and condensing apparatus. These extensions, it is hoped, will be ready for use by Christmas.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 21.

Sulphate of Ammonia.—The steadier tone noticeable at the close of last week has entirely disappeared; and it is the common theme that the market is entirely in the hands of the speculators, and makers unfortunately find themselves meanwhile at their mercy. The recent decline is ascribed in many cases to stocks held in second hands being realized. But such is not in reality the case—the statement being made to depress the market, and a more active demand from consumers would soon prove the contrary. It can be easily understood that, while "bear" operators rule the market, prices cannot recover; it being the interest of such buyers to bring prices to the lowest possible level, and keep them there. The present position cannot last much longer from the fact that sulphate is the cheapest nitrogenous fertilizer; it is much below the unit value of its competitor. This circumstance is bound to get better recognized when manure manufacturers become more alive to their nitrogen supplies for spring requirements; and the following shows the actual position:

Ammonia in—	Unit Value.
Nitrate of soda	9s. 6d.
Peruvian guano	10 0
River Plate guano	9 0 to 9s. 6d.
Hoof and horn meal	9 3 to 9 6
Dried blood	9 9 to 10 0
Sulphate of ammonia	8 3

Further comment is needless. A large business is doing in nitrate at 9s. 6d. per cwt., October shipment.

LONDON, *Nov.* 21.

Tar Products.—There is a better feeling in this market; and the various products that were apparently unsaleable a few weeks ago, are now changing hands more freely. Pyridine has again come to the front, and is realizing a fairly good price. Anthracene is not quite so weak; but very little business is reported in the article. Solvent naphtha is in good odour, and is moving off freely. Buyers are more plentiful for benzol; but their ideas of value for forward delivery mean disaster for tar distillers who have bought their tar on last year's value of products. Pitch is being largely shipped; and the value is maintained. Carbolic acid is neglected; and little or no business is being done in it. Prices ruling during the week are: Tar, 21s. to 24s. Pitch, 34s. Benzol, 90's, 3s. 3d.; 50's, 2s. 3d. Toluol, 1s. 5d. Solvent naphtha, 1s. 4½d. Crude naphtha, 1s. 2d. Creosote, 1¼d. Carbolic crystals, 5d.; crude, 60's, 1s. 2d. Cresol, 7½d. Anthracene (nominal), "A" quality, 1s. 2½d.; "B," 10d.

Sulphate of Ammonia.—Makers are extremely disappointed that, with the advance of the autumn, prices, which usually show signs of improvement at this time of the year, are still declining; and this is all the more remarkable, as nitrate, on the other hand, continues to improve in value. A "dead set" appears to have been made by dealers against any improvement in price; and unfortunately the poor demand for the article assists the movement. Business is being transacted at from £10 5s. to £10 8s. 3d., less 3½ per cent.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

Generally a want of animation is noticeable throughout the coal trade of this district; and the better qualities suitable for house-fire purposes have not been moving away so freely as of late. Here and there colliery proprietors are still behindhand with orders; but, on the whole supplies are plentiful, and the output ample to meet present requirements. Prices remain steady at about 12s. 6d. to 13s. for best Wigan Arley; 10s. 6d. to 11s. for Pemberton 4-feet and second qualities of Arley; and 9s. to 9s. 6d. for common qualities of round coal. Lessening activity in many of the principal coal-using industries is necessarily affecting the demand for the commoner descriptions of round coal suitable for iron making, steam, and general manufacturing purposes, and not only is the output of local collieries more than sufficient to meet requirements, but surplus supplies are coming in from other districts which are competing for business, and necessarily weakening prices, although quotations remain unchanged at about 8s. to 8s. 6d. for good qualities of steam and forge coals at the pit mouth. Engine classes of fuel are meeting with, if anything, a reaction sale, owing to the smaller quantities of slack now arriving from Yorkshire and other districts. But except that there are fewer cheap special lots offering in the market, there is no very material improvement in trade; and local supplies are still more than sufficient to meet requirements, with common sorts of slack continuing a drug, and weak and irregular in price. At the pit mouth good ordinary qualities of burgy are obtainable at 5s. 9d. to 6s. 3d.; best slack, at 5s., with some special sorts quoted at 5s. 6d.; good ordinary qualities, 4s. to 4s. 6d.; and common sorts, about 3s. per ton. In the shipping trade, there has been more doing, owing to a considerable number of vessels having recently arrived in port; and good qualities of steam coal are readily fetching 9s. 6d. to 10s. per ton delivered at the Garston Docks, or the High Level, Liverpool.

Northern Coal Trade.—There has been a change in the last week in the coal trade, due to the effect of the strike in France. Many orders for coal for the country for railway purposes have been received; and this has given some animation to the steam coal especially, and has stiffened the prices. For best Northumbrian steam coal, the price now varies from 10s. 3d. to 10s. 6d. per ton free on board; and second qualities have also advanced in price, while small steam coal is steady. There has been some inquiry for gas coal for France; but as yet, as far as is known, no orders have been booked. The production of gas coal is now large; but the consumption is very high, and the output is thus well taken up. The price may be generally given as about 9s. 6d. per ton, free on board; but there are sellers who ask less as well as more. Shipments of gas coal to the south are rather impeded by the want of steamships. Bunker coal for steamers is in rather better demand than it has been; but there is no alteration in the price generally quoted. Manufacturing coal is dull; and the consumption of household coal is less than usual at this period of the year. In coke best blast-furnace qualities are a little more in demand, and there have been sales at an advance—the current price for export being about 16s. per ton free on board. Gas coke is unaltered, but the sales on contract over next year will be at a considerable reduction on the prices of the present year's contracts.

Reduction in the Price of Gas at Chertsey.—At the annual meeting of the Chertsey Gas Company last Thursday, the Directors reported that they had decided to reduce the price of gas by 2d. per 1000 cubic feet as from March next. The dividend declared on the original shares was 11 per cent., and on the new "D" stock 8 per cent.

Issue of Further Debenture Stock in the South Metropolitan Gas Company.—On the 16th prox., Messrs. G. A. Wilkinson and Son will sell by auction, at the Mart, Tokenhouse Yard, E.C., £25,000 of 5 per cent. perpetual debenture stock in the South Metropolitan Gas Company. In order to meet the requirements of all classes of investors, the stock will be divided into numerous lots.

Gas Explosion in Liverpool.—A serious explosion of gas took place last Saturday morning at a shop in Heyworth Street, Liverpool, occupied by a leather dealer. A gas-fitter had been sent to remedy a leak; and, in searching for it, he struck a match, the flame from which instantly caused an explosion. The windows were blown out, and the ceiling much damaged. The workmen had marvellous escapes; but a son of the occupant was severely injured. Some adjoining buildings had windows broken, and other damage was done.

Electric Lighting in the City.—At the conclusion of the meeting of the Commissioners of Sewers of the City of London last Tuesday, the Engineer (Mr. W. Haywood, M. Inst. C.E.) announced that he had just received a most important communication from the City of London Electric Lighting Company, who are entrusted with the carrying out of the electric lighting in the City, praying for an extension of the time allotted them for fulfilling their contract. The letter in question was not read, as there were only a few members present; but the announcement gave rise to expressions of indignant surprise, after the great delay that has occurred. It was ultimately resolved to print and circulate the letter among the members of the Court at the earliest possible moment; and the subject will be considered at the next meeting of the Court.

Sale of Shares.—On Monday last week, Mr. Alfred Richards, of Tottenham, offered for sale by auction, at the Mart, Tokenhouse Yard, 250 shares of £5 each in the *Romford Gas Company*, bearing a maximum dividend of 7 per cent. They were issued by order of the Directors, in pursuance of the provisions of the Romford Gas Act, 1889. There was keen competition for the shares, all of which sold at £6 10s. each, with the exception of one lot, which realized £6 12s. 6d. On the same occasion, Mr. Richards sold between 100 and 200 shares in the *West Ham Gas Company*, at prices ranging from £10 10s. to £11 per share. Between 100 and 200 fully-paid £6 shares in the *Crystal Palace District Gas Company*, bearing a maximum dividend of 7 per cent. were disposed of at from £8 15s. to £9 each. Some fully-paid £10 shares in the *West Kent Gas Company*, on which 10 per cent. interest has been paid for many years, fetched £19 15s. per share.

Proposed New Gas-Works for Wallasey.—At a special meeting of the Wallasey Local Board yesterday week, the Gas and Water Committee submitted minutes which showed that they had had under discussion the question of constructing new gas-works. They proposed that the Manager's report, estimate, and plans be approved, subject to any modifications the Committee hereafter agreed upon, and that it be recommended to the Finance Committee that the necessary steps should be taken to apply to the Local Government Board for a Provisional Order to sanction the borrowing of £50,000 for the new works—it being understood that not more than was absolutely required should be expended at present. A long discussion followed, in the course of which several members expressed doubt as to whether the Local Government Board would sanction the borrowing of £50,000 on plans which showed an expenditure of £100,000. Ultimately the resolution was adopted.

The Gas Question in the Salford Out-Districts.—The Swinton and Pendlebury Local Board are (says a Manchester contemporary) taking active measures to secure the advantages they have obtained by the insertion of the clause in the Salford Gas Bill last July; and they are to apply to Parliament this next session, not only for powers to supply the districts of Swinton, Pendlebury, and Clifton with gas, but also the district of the Eccles Local Board; and their preparations are in an advanced state. The members of the Swinton Gas Committee have been over the land at Barton which the Eccles Local Board have bought for gas and sewage purposes; and it is proposed by Swinton to schedule this land as one of the sites for the gas-works. It is said that the Swinton Local Board are anxious to keep up friendly relations with Eccles; but they cannot, at any cost, allow the opportunity now offered, of getting the power to manufacture and supply gas, to pass without acquiring that power. The clause referred to distinctly empowers Swinton to apply, and debars Salford from opposing. Eccles was a party to this clause. The leaders of the opposition at Eccles urge that if joint gas-works had been erected for the Barton, Eccles, Patricroft, Irlam, Swinton and Pendlebury, Worsley, Walkden, Little Hulton, and Clifton districts, and the representation on the Management Committee proportioned according to the rateable value, no opposition would have been offered to the Bill.——At a meeting of the Eccles Local Board yesterday week, a Sub-Committee submitted a report on the gas question. It stated that the consumption of gas in the Eccles district was 76,985,000 cubic feet; Irlam and Gadishead, 2,273,000 feet; Worsley, 19,369,000 feet; Little Hulton, 5,619,000 feet—total, 104,246,000 feet. The cost of new works, mains, &c., for such a district as theirs would be £600 per million cubic feet; so that the cost of production of 105,000,000 feet was put down at £63,000. The receipts, at 2s. 8d. per 1000 feet, would yield a profit of £3000 per annum, after the payments of the instalments of loan and interest, and would allow the sale of gas at a reduction of 6d. per 1000 feet on the present charge—equal to a rate of 8d. in the pound.

The Alleged Lead-Poisoning at Wakefield.—The Water Committee of the Wakefield Corporation have decided that Dr. Tidy and another expert shall be engaged to thoroughly investigate the question of alleged lead-poisoning from the use of the water supplied from the Corporation works, with the object of ascertaining the cause, and applying such remedial measures as the Corporation may be advised to be necessary and expedient. One of the main objects of the inquiry will be to make an exhaustive examination of the water from its source on the Rishworth Moors to the point at which it is delivered to the consumer.

The Electric Light Question at Brighton.—The principal subject for discussion at the meeting of the Brighton Town Council last Thursday was the proposal to purchase the goodwill of the Brighton and Hove Electric Light Company for £7000, and the request of the Lighting Committee for power to borrow £8500 for the purpose of laying further mains and other works. The Council discussed the matter *in camera*. On resuming the ordinary meeting, the Town Clerk said that resolutions had been adopted to the effect (1) that the Council be recommended not to agree to purchase the goodwill and undertaking of the Company on the terms contained in the report, and (2) that the Council be directed to apply to the Local Government Board for sanction to borrow £8500 for thirty years, for the purposes of the electric light undertaking. Both resolutions were passed.

The Water Supply of Nottingham Out-Districts.—At the meeting of the Nottingham Town Council on Monday, the 9th inst., the Water Committee were empowered to make an application to the Local Government Board for a Provisional Order to amend the Nottingham Water Act, 1879, by providing that section 3 should read as "from and after the date of such Order the limits within which water may be supplied shall extend to and include (in addition to the places therein named) the parish of West Bridgford, or so much thereof as is included in the district of the newly-elected West Bridgford Local Board, and on the same terms and with the same powers as the supply to such other places." There is considerable opposition in the West Bridgford district to the supply of water by the Corporation; and many wish the Local Board to carry out an independent scheme.

The Artesian Well in the City.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, the Medical Officer of Health (Dr. Sedgwick Saunders) reported upon his analysis of the water from the artesian well which is now being sunk in proximity to the artizans' dwellings near the Minories, and is intended to supply those dwellings, and possibly the surrounding district. He stated that the water was high in the list of first-class waters as to purity; and, being of remarkable softness, was admirably adapted for all kinds of domestic and boiler purposes. In view of this report, and the statement of the Medical Officer that if the well were deepened as proposed, the water might not be so good, the Sanitary Committee had stopped the works until the Commission expressed their opinion upon the matter. After a long debate, it was decided to risk the sinking of the well to an additional depth of 200 feet; making 568 feet in all.

Results of the Last Quinquennial Valuation.—The Comptroller of the London County Council (Mr. A. Gunn) has drawn up a return showing the results of the recent quinquennial valuation. Starting with 1871, when the rateable value of the county of London was £19,971,281, the increase is shown on each subsequent year. By 1875 the total was £21,252,434; and in the following year, when the quinquennial valuation was made, it rose to £23,111,313. In 1881, it advanced to £27,386,086; and in 1886, to £30,458,005. The figure given for the present year is £33,081,766, though it is pointed out that this result is subject to certain appeals still pending. Thus the quinquennial increase was, in 1876, £3,140,032; in 1881, £4,274,773; in 1886, £3,071,919; and in the present year, £2,623,761. The totals for the four years prior to the recent valuation are: 1887, £30,758,796; 1888, £31,033,786; 1889, £31,387,848; and 1890, £31,584,951.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 933.)

Issue.	Share	When ex-Dividend.	Dividend & Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11½–12½	..	5 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	..	4 12 7
100,000	20	28 May	8	Bahia, Limited	20	13–15	..	10 13 4
200,000	5	12 Nov.	7½	Bombay, Limited	5	6¼–6¾*	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾–5¼*	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	210–220	..	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40–42	..	5 9 6
444,250	Stck.	16 Sept.	10	Bristol	100	206–211	..	4 14 6
320,000	20	15 Oct.	11½	British	20	42–44	..	5 2 3
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18–20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13–15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	6–7	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	92–96	..	6 5 0
150,000	20	13 Aug.	8	Cagliari, Limited	20	24–26	..	6 3 1
550,000	Stck.	15 Oct.	13½	Commercial, Old Stock	100	240–250	..	5 10 0
161,396	,,	,,	10½	Do. New do.	100	185–195	..	5 10 3
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119–124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	215–225	..	4 8 10
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190–200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
486,090	10	15 July	10	European, Limited	10	19–20	..	5 0 0
354,660	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	216–220	+½	5 18 2
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94–97	+1	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250–255	..	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118–123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172–177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	155–160	..	4 7 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	249–254	..	3 18 9
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145–155	..	3 17 5
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112–115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120–125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163–168	..	3 11 5
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	213–218*	..	5 10 1
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¾–4¾	..	6 6 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	11 June	6⅔	Monte Video, Limited	20	16–17	..	7 12 11
150,000	5	28 May	10	Oriental, Limited	5	8¼–8¾	..	5 14 3
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2¾–3½	..	—
				People's Gas of Chicago—				
420,000	100	3 Nov.	6	1st Mtg. Bds.	100	90–95	..	6 6 4
500,000	100	1 June	16	2nd Do.	100	90–95	..	6 6 4
150,000	10	15 Oct.	10	San Paulo, Limited	10	12½–13¾	..	7 8 1
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	260–270	..	5 14 10
1,350,000	,,	,,	12	Do. B do.	100	220–225	..	5 6 8
200,000	,,	,,	13	Do. C do.	100	225–235	..	5 10 8
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	140–145	..	3 9 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	262–267	–1	3 14 11
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	202–207	–2	3 17 3
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138–143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	104–109	–1	3 13 5
708,000	Stck.	13 Aug	10½	Kent	100	260–270	..	3 17 9
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	231–236	–2	4 0 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	192–197	–3	3 16 2
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118–121	..	3 6 1
500,000	100	13 Aug.	12½	New River, New Shares	100	335–345	..	3 10 4
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123–126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	155–165	–2½	3 18 9
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160–165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex	100	245–255	–2½	3 18 5

*Ex div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

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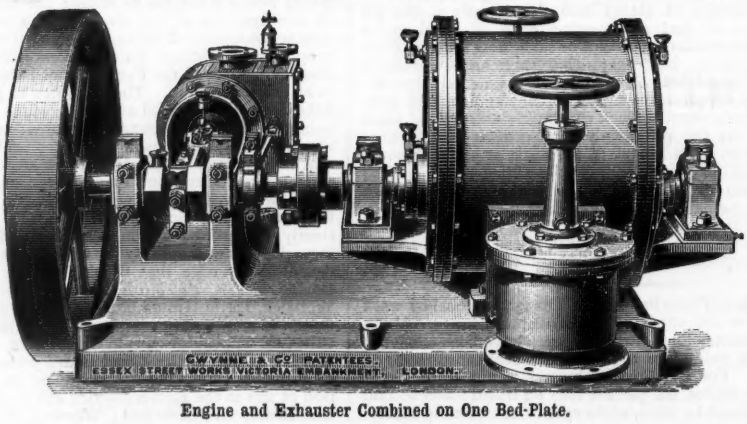
They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



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Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

DESTRUCTIVE DISTILLATION: A Manuelette of the Coal Tar, Paraffin, Rosin Oil, &c., Industries. By Professor MILLS, D.Sc., F.R.S. Imp. 8vo., 4s.
LONDON: GURNEY AND JACKSON.

WANTED, by a Youth (aged 19), a SITUATION in Gas Works or Office. The North of England preferred. Five years' experience.
Address No. 2038, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man a Situation as MANAGER of a small Gas-Works. Well up in the Manufacture and Distribution of Gas, Index reading, Main and Service laying, &c. Good references.
Address A. TULK, Gas-Works, Milborne Port, SOMERSET.

TO GAS ENGINEERS AND FITTERS.

WANTED, a Situation as Estimate CLERK or FOREMAN. Advertiser has had extensive Experience in fitting up Mansions and Trade Establishments, and in erecting private and public Gas-Works. Is an able Mathematician used to calculating photometer scales, powers of lights at distances, &c.
Apply to LUCEM, 60, Birdhurst Road, WANDSWORTH.

WANTED, a steady Man, as Stoker.
Employment all the year round.
Apply, by letter, to No. 2036, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
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Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 972 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1880, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE 173, Fentiman Road, LONDON, S.W.

WANTED, for a Country Gas-Works, making about 60 millions, an intelligent YOUTH as Weigh Clerk, Time Keeper, and General Works Clerk. Some knowledge of Drawing desirable. A good opening for one desiring to improve knowledge of Gas-Works routine.
Apply, by letter, stating wages, to No. 2037, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady, industrious, and experienced Man (about 30) as MAIN and SERVICE LAYER and METER FIXER, and to have a little knowledge of Smith-work. Permanent Situation for a suitable person.
Apply, in own handwriting, stating experience, and wages required, with references from present employers to Mr. JNO. MARSLAND, Gas-Works, SOWERBY BRIDGE.

WANTED, "King's Treatise on Coal Gas," complete.
Send lowest price to H. FAGGETTER, Epsom Road, CROYDON.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 967.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

WATER SUPPLY AND SEWAGE.
Short Notes for Non-Technical Readers. By EDMUND J. MILLS, D.Sc., F.R.S. 8vo., 1s.
LONDON: GURNEY AND JACKSON.

WANTED, at once, a second-hand 6-inch STATION GOVERNOR, with Valves and Connections complete, in thorough working order.
Full particulars and price, delivered at Nuneaton, to be sent to the MANAGER, Gas-Works, NUNEATON.

WANTED, a set of four second-hand PURIFIERS, 8 or 9 feet square, and 4 or 5 feet deep, with or without Centre-Valve and Lifting Gear. Must be in good condition.
Full particulars and price to No. 2035, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Four Purifiers, 8 feet square by 4 feet deep; One CENTRE-VALVE with 8-inch Connections, to work the four Purifiers; Two 8-inch BYE-PASS VALVES; and One 8-inch Pipe CONDENSER. All are in good condition, and may be seen at the Willington Quay Works of the Walker and Wallsend Union Gas Company.
Tenders to be sent to the Secretary of the Company, on or before the 30th of November, 1891.

NOW READY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.

1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

***The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

COAL TAR for Sale, delivered at the Great Western Railway, Thame. TENDERS invited.

Apply to JOHN SEYMOUR, Gas-Works, THAME.

TO BE SOLD by Tender—A Cast-Iron TANK and GASHOLDER. The Tank is 64 ft. by 14 ft. 8 in. deep. The Gasholder is 62 ft. by 14 ft. There are Ten Cast-Iron Columns, 22 feet long.

The above may be seen at the old Works of the Gas Company at Rugby.

The whole must be removed, and the ground cleared, by March 25, 1892.

Tenders to be sent in by (not later) Thursday, Dec. 3, marked "Tender for Gasholder."

For further particulars apply to P. SIMPSON, Manager, Gas-Works, RUGBY.

CITY OF CARLISLE.

SELF-SEALING Oval Mouthpieces for SALE—

18 Uprights, 21 in. by 15 in., with 5-inch Outlets.
6 Right-hand, 21 in. by 15 in. do.
6 Left-hand do. do.
3 Blank, 21 in. by 15 in.
3 Right-hand 21 in. by 15 in. with 6-inch Outlets.
3 Blank, 24 in. by 15 in.
3 Left-hand, 24 in. by 15 in., with 6-inch Outlets.
3 Left-hand 24 in. by 15 in., with 5-inch Outlets.
3 Right-Hand, 24 in. by 15 in. do.

The whole of these self-sealing Mouthpieces are Morton's Patents, with Carpenter's Bolts, and were made by Tangye Bros. and Holman, and all are in good order.

J. HEPWORTH.
Gas-Works, Carlisle.

SALE.

HUTCHINSON BROTHERS, Gas Engineers, Meter Makers, &c., Barnsley, having removed to more convenient Premises, are offering FOR SALE by PUBLIC AUCTION, on Dec. 3, at their Dearne Works, Old Mill, Barnsley, SURPLUS PLANT, MACHINERY, &c., including—

CONTINUOUS SULPHATE OF AMMONIA PLANT, with Cast-Iron Tower, Lime-Stills, Condenser, Coke Scrubber, Cast-Iron Tanks, Lead-Lined Tanks, Store Boilers, &c.
COAL-TESTING APPARATUS.
LABORATORY APPARATUS and CHEMICALS.
Several Lathes, Drilling and Punching Machines, Pipe and Bolt Screwing Machine, Cranes, Crab Stocks, Taps and Dies, Tools, and Sundries.

Catalogues may be had after the 28th inst.

FOR SALE—One Reciprocating Pump Exhauster, with Steam-Engine combined, to pass 30,000 cubic feet per hour, with 12-inch Bye-Pass Valves and Connections.

One ROTARY EXHAUSTER, to pass 15,000 cubic feet per hour, with Steam-Engine combined, upon Cast-Iron Bed-Plate, with a Governor to regulate Steam and Gas Compensating Valve, with 8-inch Bye-Pass Valves and Connections.

One ROTARY EXHAUSTER, Steam-Engine combined, to pass 5000 cubic feet per hour, with 6-inch Valves and Connections.

The whole of the above are new, and are of high-class finish. The materials and workmanship are of the very best description. The Exhausters can be seen at work.

Two CAST-IRON SCRUBBERS, 10 feet in diameter, 40 feet high, with Wrought-Iron Domes. All the Scrubber-Plates are machine planed; and all the materials and workmanship are of the best description, and can be inspected.

Two STEAM-PUMPS to deliver 1800 gallons per hour.
Two do. do. 1400 do. do.
One do. do. 700 do. do.

These Pumps are most substantial and thoroughly reliable, delivering to a height of 100 feet.

The above is an exceptional opportunity for Gas Companies or Corporations purchasing absolutely new Plant at reduced prices.

For further particulars apply to No. 2021, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LONDON COUNTY LUNATIC ASYLUM, COLNEY HATCH, N.

GASHOLDER.

THE SUB-COMMITTEE of the above-named Asylum offer FOR SALE a GASHOLDER, 30 feet diameter by 14 feet deep, with Five Cast-Iron Columns, Cast-Iron Girders to top of Columns, Guides, and Guide-Rollers.

The Gasholder can be inspected at the Asylum: and forms of tender, upon which only tenders will be received, can be obtained of the Steward at the Asylum.

The form of tender is to be filled up, and sent in a sealed envelope, endorsed "Tender for Gasholder," on or before the 30th day of November inst., to the undersigned.

The Sub-Committee do not bind themselves to accept the lowest or any tender.

R. W. PARTRIDGE,
Clerk to the Asylums Committee.

London Asylums Committee Office,
40, Craven Street, Strand, W.C.
Nov. 10, 1891.

TO GASHOLDER AND BOILER MAKERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the TELESCOPING, with two additional Lifts, a 100 feet GASHOLDER.

Plans and Specification may be seen at the Office of the undersigned.

Tenders, endorsed outside, must be sent to the Chairman, on or before the morning of Monday, Nov. 30.

Also for a Lancashire (Steel) BOILER, 26ft. by 7 ft.

Particulars may be had from the undersigned.

Tenders to the Chairman by the morning of the 30th of November.

(Signed) JOHN CHEW,
Gas Engineer.

Gas Office, Blackpool,
Nov. 11, 1891.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve months.

Specifications and forms of tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Sealed tenders, marked "Tender for Fire-Clay Goods," must be delivered by post, addressed to the undersigned, not later than Monday, the 30th inst.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Nov. 6, 1891.

BOROUGH OF WEST BROMWICH.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders, accompanied with Drawings and Specifications, for the construction and erection of a TWO-LIFT GASHOLDER, 120 feet diameter, at their Gas-Works, Albion, West Bromwich.

A copy of the general conditions and other information may be obtained upon application to Mr. Wm. Littlewood, the Manager of the Gas-Works.

Tenders, endorsed "Tender for Gasholder," to be delivered to me not later than Thursday, Jan. 7 next.

The Gas Committee do not bind themselves to accept the lowest or any tender.

By order,
THOS. HUDSON,
Secretary.

Secretary's Office, West Bromwich,
Nov. 21, 1891.

PITCH.

TENDERS are invited for the supply of 30 tons of PITCH per week, delivered at St. Helens during Nine months ending December, 1892.

Address Box 5, Post Office, ST. HELENS.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works for the Year 1892.

Quantity about 40,000 gallons.

Contractor to furnish Barrels, and accept delivery at Consett and Blackhill Station.

Tenders to be sent in not later than Dec. 3.

M. RICHLEY,
Secretary.

Nov. 18, 1891.

COUNTY BOROUGH OF BRADFORD.

TO IRONWORK CONTRACTORS, SLATERS, AND PLUMBERS.

THE Bradford Corporation are prepared to receive TENDERS for the supply and erection of CAST-IRON COLUMNS, IRON ROOF, and RAILWAY PLATFORM for a New Retort-House, 320 ft. by 90 ft., at their Birkshall Gas-Works.

Also for the SLATING and PLUMBERS' WORK required in connection with the same.

Plans and Specifications may be seen, and Bills of Quantities obtained, on application to Mr. Wood, Gas Engineer, at the Mill Street Gas-Works.

Tenders, endorsed "Tender for Retort-House Roof," to be sent to me on or before the 9th of December next.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
W. T. M'GOWEN, Town Clerk.

Town Hall, Bradford,
Nov. 20, 1891.

DUNDEE WATER-WORKS.

LINTRATHEN SUPPLY.
CONTRACT No. 1.

THE Dundee Water Commissioners are prepared to receive TENDERS for 4100 tons, or thereby, of CAST-IRON PIPES and SPECIAL CASTINGS, 24 inches and 27 inches diameter.

ALSO
CONTRACT No. 2.

For the EXCAVATION and other WORKS necessary in CARTING, LAYING, and JOINTING 7 miles, or thereby, of PIPES, 24 inches and 27 inches diameter.

Specifications, Schedules of Quantities, and Drawings may be obtained on and after Wednesday, the 18th current, on application to the Subscriber on payment of the sum of Two Guineas for each Contract, which sum will be returned on receipt of a *bonâ fide* tender, with prices filled in as required.

Sealed offers, endorsed "Tender for Contract No. 1" or "No. 2," as the case may be, to be delivered at the Subscriber's Office not later than Noon on Tuesday, the 1st of December, 1891.

The Engineer will meet intending Contractors at Auchterhouse Station on Wednesday, the 18th current, at One p.m. to show them over the line of intended Works.

The Commissioners do not bind themselves to accept the lowest or any offer.

GEORGE BAXTER, Engineer.

Dundee Water Commissioners' Engineer's Office,
7, Euclid Street, Nov. 10, 1891.

NEW ROMNEY GASLIGHT AND COKE COMPANY, LIMITED.

THE Directors of the above Company have FOR DISPOSAL the REMAINDER of the Issue of 400 SHARES—viz., 84 Shares of £5 each.

Applications for such Shares at par to be made on or before the 28th inst., to

WM. ALLEN, Secretary.

New Romney, Kent,
Nov. 14, 1891.

THE COST OF PURIFICATION REDUCED

to a minimum by

C. & W. WALKER'S

PATENT PURIFYING MACHINE,

Which has now fully proved itself to be the most effectual, powerful, and perfect Apparatus in the World,

FOR PURIFYING GAS FROM

TAR, CARBONIC ACID, AMMONIA

and a large portion of

SULPHURETTED HYDROGEN,

Doing all the work of Purification between the Condensers and Purifiers, and relieving them of much work. Its cost is less than any other known Apparatus for purifying Gas from Tar and Ammonia.

Testimonials, Drawings, and Prices on Application.

8, Finsbury Circus, London, E.C. · Midland Iron-Works, Donnington, near Newport, Shropshire.

RE BECK GAS-ENGINE COMPANY, LIMITED. IN LIQUIDATION.

THE Valuable Stock of New and Exhibition ENGINES, ranging from 1 to 16 horse power, as well as the various Finished Duplicate and other parts, also the BRITISH and COLONIAL PATENTS, and the DESIGNS, PATTERNS, and DRAWINGS connected therewith, will be SOLD BY PUBLIC AUCTION, at the County Hotel, Newcastle-upon-Tyne, on Wednesday, Dec. 9, at Two p.m., in one lot, or if not so disposed of, then in lots to suit buyers.

The Engines, Duplicate Parts, and Patterns can be inspected at the Works of Messrs. BLACK, HAWTHORN, AND Co., GATESHEAD-ON-TYNE; whilst particulars relating to the Patents and Drawings can be obtained from Messrs. SNOWBALL AND Co., Mechanical Valuers, &c., Crown Chambers, Side, NEWCASTLE-UPON-TYNE.

Applications for List of Engines, &c., may be made to them, or to W. B. PEAT, Esq., the Liquidator, 3, Lothbury, LONDON, E.C.

THE BRISTOL GAS COMPANY.

MESSRS. GEORGE NICHOLS, SON, AND ALDER are instructed to offer FOR SALE by Public Auction at their Sale Room, 49, Broad Street, Bristol, on Tuesday, the 1st day of December next, at 2.30 p.m. precisely, in Lots of £100 each,

£20,000 NEW DEBENTURE STOCK,

created and issued in manner prescribed by The Bristol Gas Act, 1891.

Particulars and copies of the Conditions of Sale may be obtained on application to the undersigned; to the AUCTIONEERS, 49, Broad Street, BRISTOL; or to Messrs. BRITTAN, LIVETT, AND MILLER, Solicitors, Albion Chambers, BRISTOL.

JAMES VINCENT GREEN,
Secretary.

Chief Offices: Canon's Marsh,
Bristol, Nov. 4, 1891.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

By order of the Executors of the late J. J. Stevens, Esq.—465 £10 shares in the West Kent Gas Company, and 84 £10 shares in the Mitcham and Wimbledon District Gaslight Company, both paying 10 per cent. Dividends; all fully paid and first issue, in numerous lots.

MESSRS. BROAD AND WILTSHIRE will SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Friday, Dec. 18, 1891, at Two o'clock precisely, 465 FULLY-PAID £10 SHARES in the West Kent Gas Company, the Works of which are situate at Erith and Crayford in Kent; also 84 FULLY-PAID £10 SHARES in the Mitcham and Wimbledon District Gaslight Company, whose Works are at Mitcham.

Both Companies pay Dividends of 10 per cent. They supply large and rapidly increasing Districts; and their Shares may be considered as offering to the public a thoroughly sound investment.

Particulars at the MART; of J. J. KEILY, Esq., Solicitor, 366, GOSWELL ROAD, E.C.; or of the AUCTIONEERS, 7, Queen Street, CHEAPSIDE, E.C.

SOUTH METROPOLITAN GAS COMPANY.

£25,000 Five per Cent. Perpetual Debenture Stock of the above Company, presenting an Investment of the soundest description.

MESSRS. G. A. WILKINSON & SON are instructed by the Directors to SELL BY AUCTION, at the Mart, on Wednesday, Dec. 16, at Two o'clock precisely, in numerous lots, to suit large and small purchasers, £25,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK of the South Metropolitan Gas Company.

The Districts supplied by the Company comprise nearly the whole of the South of London from Wandsworth to Plumstead Marshes, and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten years.

Particulars may be had of FRANK BUSH, Esq., Secretary of the Company, 709A, OLD KENT ROAD; of Messrs. BUDD, JOHNSONS, AND JECKS, Solicitors, 24, AUSTIN FRIARS; and of Messrs. G. A. WILKINSON AND SON, Surveyors and Auctioneers, 7, Poultry, CITY.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

NOTICE OF REMOVAL.

HUTCHINSON BROTHERS beg to inform Engineers and Managers of Gas-Works an do thers that, in order to concentrate the various Branches of their Business, THEY HAVE REMOVED from Dearne Works, Old Mill, and Albert Works, Church Street, to larger, more central, and convenient Premises—

FALCON WORKS, SACKVILLE STREET, BARNSLEY,

which is now their only address, and where the whole of their business as Gas Engineers, Wet and Dry Gas Meter and General Gas Apparatus Makers, Brass Founders and Finishers, Lead Burners, &c., &c., will in future be carried on.

They take this opportunity of thanking their friends for the patronage accorded to them in the past, and trust the same will be continued at the new Premises, where the greater facilities they possess, and the increased personal supervision they will be able to give, will enable them to carry out the various Works entrusted to them with despatch, and at the same time maintain the high-class character which their Work and Manufactures have obtained.

Telegrams: "HUTCHINSON BROTHERS, BARNSLEY."

November, 1891.

Now Ready, price 15*s., limp cloth, the Eleventh Yearly*

ANALYSIS OF THE ACCOUNTS OF THE METROPOLITAN WATER COMPANIES,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex. Showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied, for the year ended December 31, 1890, or March 31, 1891, together with the quantity of water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., for the year ended Dec. 31, 1890.

Compiled and arranged by **ALFRED LASS,** Fellow of the Institute of Chartered Accountants.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

THOMAS LIGHTING Co.,
LTD.,
15, CARTHUSIAN ST.,
LONDON, E.C.

Manufacturers of the "**Thomas**" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

PATENTS FOR INVENTIONS,
REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

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Special experience in Gas and Ammonia Plant.

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Near **HALIFAX,**
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
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TAR, LIQUOR, AND SPENT OXIDE
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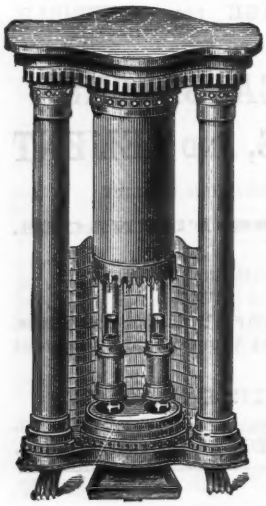

THE "SYPHON" (REGISTERED TITLE.)
(CLARK'S PATENT.)

Hygienic Gas-Heating Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas-Heating Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

Adopted by the principal Gas Companies throughout the Kingdom.

Illustrated Price Lists on application to

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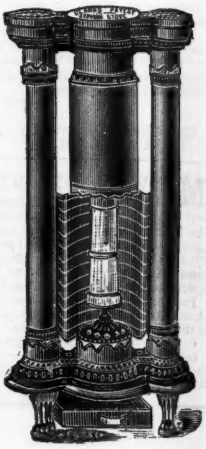
Telgraphic Address: "Syphon Stoves London."



Important Decision in the Court of Appeal, before Lords Justices Lindley, Bowen, and Kay.

THE WENHAM COMPANY, LIMITED,

v.

THE CHAMPION GAS-LAMP COMPANY.

Whereas the above-mentioned action for Infringement of Letters Patent granted to Frank Wm. Clark, dated 1st July, 1881, No. 2869 (of which Letters Patent the Wenham Company, Limited, are the Assignees), was tried before Mr. Justice Vaughan Williams on the 7th, 8th, 9th days of May, 1891, and on the 13th day of May, 1891, Judgment was in the said action given for the Plaintiffs, the Wenham Company, Limited; and a perpetual injunction was granted restraining the Defendants from infringing the said Patent, an enquiry was directed as to the damages suffered by The Wenham Company, Limited, and the Defendants were ordered to deliver up certain Lamps made in infringement of the said Patent, and to pay to the Plaintiffs the costs of the said action. And Whereas the Defendants having appealed from the said judgment, and their appeal came on for hearing before the Court of Appeal on the 6th and 7th of November, 1891, the Court, on hearing the Appeal, affirmed the judgment of Mr. Justice Vaughan Williams, and dismissed the Appeal with Costs.

Notice is hereby given, that legal proceedings will forthwith be taken by The Wenham Company, Limited, against all persons who make or sell Lamps constructed according to the invention comprised in the above-mentioned Patent, and who otherwise infringe the same Patent.

J. H. JOHNSON, SON, & ELLIS,
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Solicitors for the Wenham Company, Limited.

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CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

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(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, the Ipswich Gas Company, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
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COKE BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

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AND
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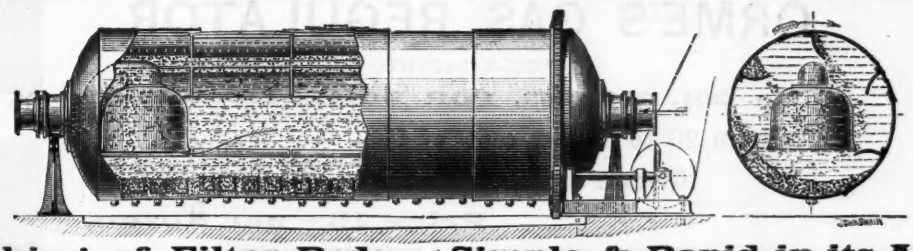

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Simple & Rapid in its Action.
Organic Matter Considerably Reduced.
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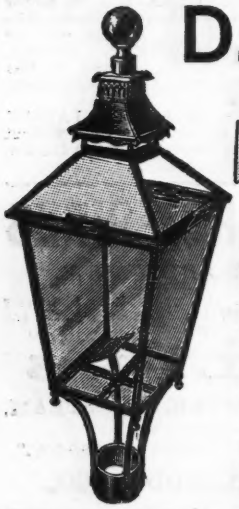

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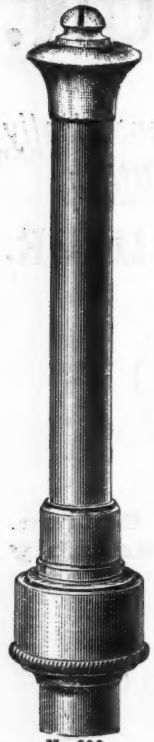

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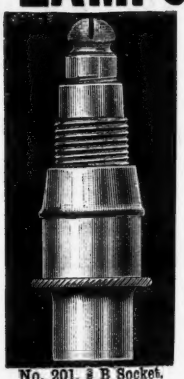

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Gives a bright and steady Light.

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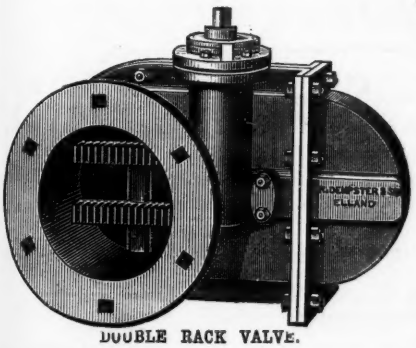

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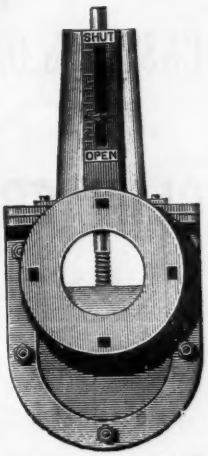

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GOLD MEDAL, PARIS EXHIBITION, 1889.

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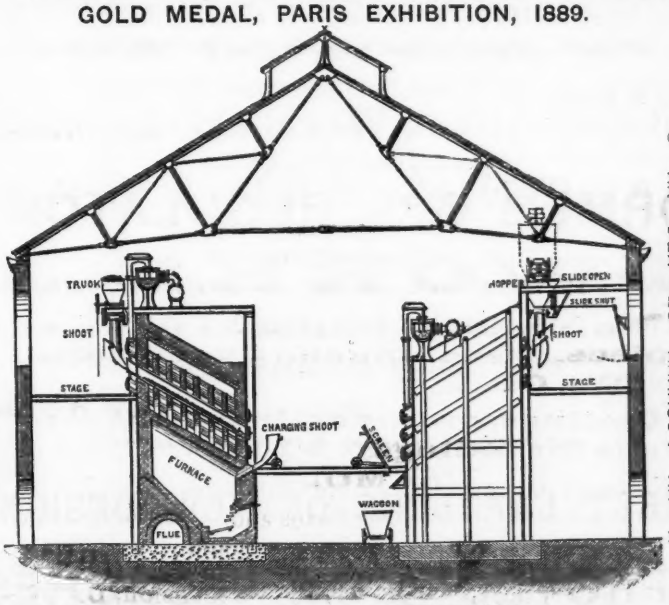

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Showing Ascension-Pipes and Hydraulic Main at top of Retort. Charged by movable Shoot and Truck.

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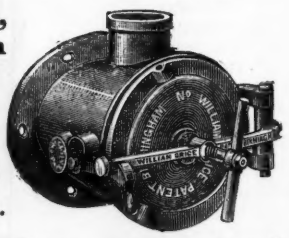

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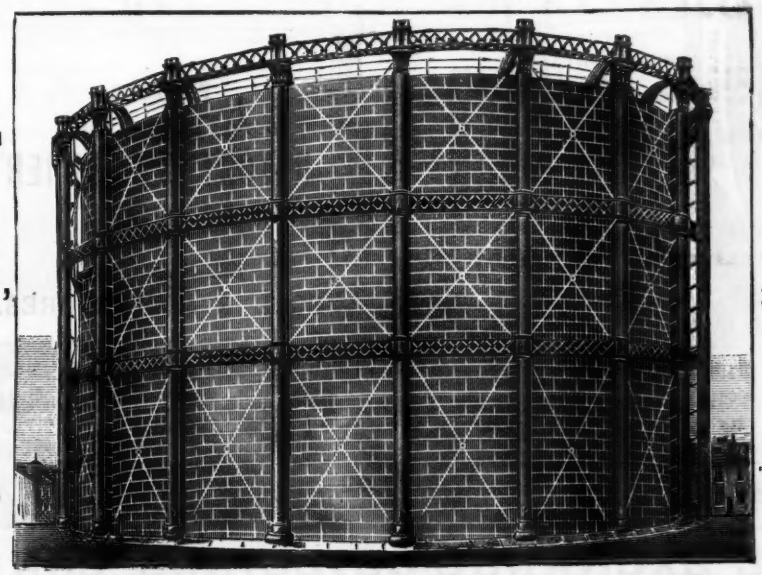

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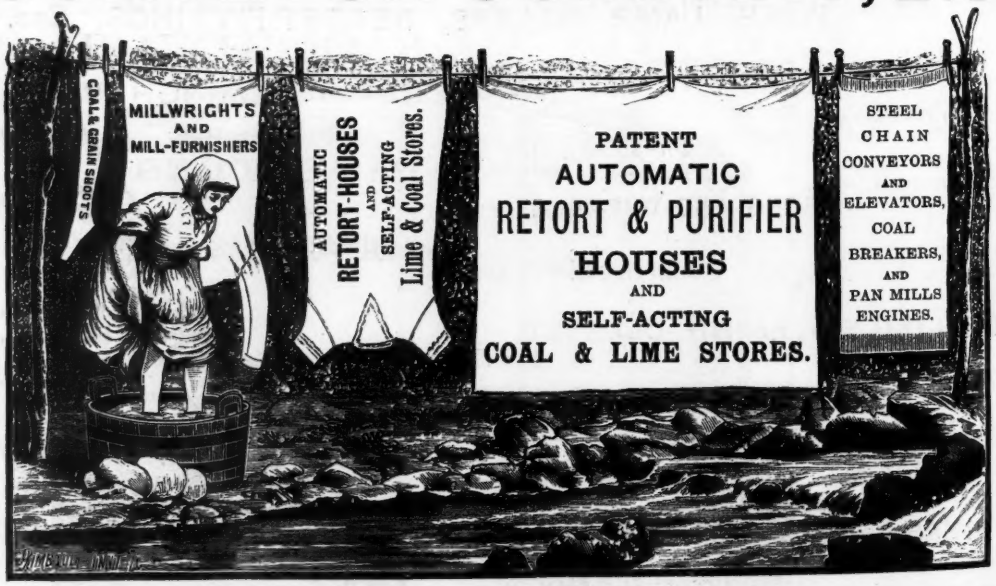
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Absolutely Harmless and free from Acids.

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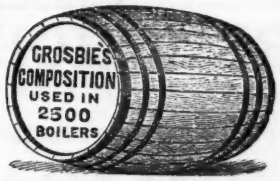

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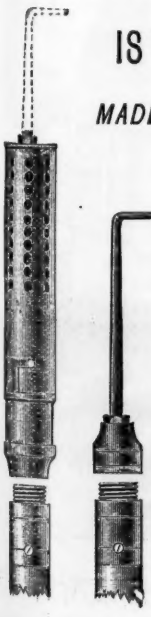

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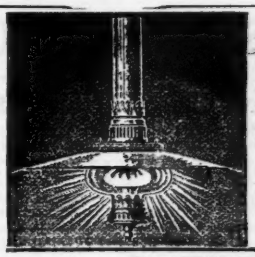
Gas Engineers, Gas-Meter Makers, &c.,

BARNSLEY.



THE DEIMEL

HIGH-POWER GAS-LAMP.

The attention of Gas Engineers is particularly called to this Lamp as being the cheapest, most simple, durable, and adaptable Lamp in the market.

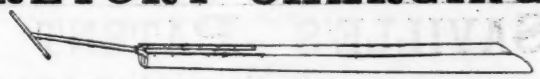
Two sizes, consuming 6 feet and 9½ feet per hour respectively.

FOR PARTICULARS AND TERMS, APPLY TO

THE DEIMEL LIGHT COMPANY, Ltd.,

88, GRAY'S INN ROAD, LONDON.

STEEL SCOOPS FOR RETORT CHARGING.



Scoops supplied with or without handles and of any dimensions or shape required

HENRY SYKES, Engineer,

66, BANKSIDE, LONDON, S.E.

HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all Classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

J. & W. HORTON

ETNA WORKS,

SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

AND

MANUFACTURERS

OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimate supplied.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

SAVILLE'S PATENT REGULATOR WASHER

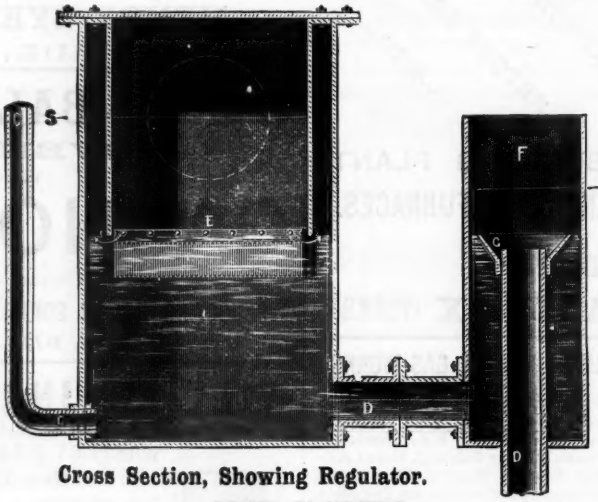
(As described in the JOURNAL OF GAS LIGHTING for Sept. 2, 1890.)

The only Washer without moving parts that can be fixed before an Exhauster.

No more Gas spoilt by over-running the Exhauster.

Perfectly Self-acting.

Particulars and prices on application.



Cross Section, Showing Regulator.

The only safe arrangement to work without Dip.

Less wear and tear on the Exhauster.

No moving parts.

Occupies small space.

State maximum make of Gas per diem.

SOLE MAKERS:

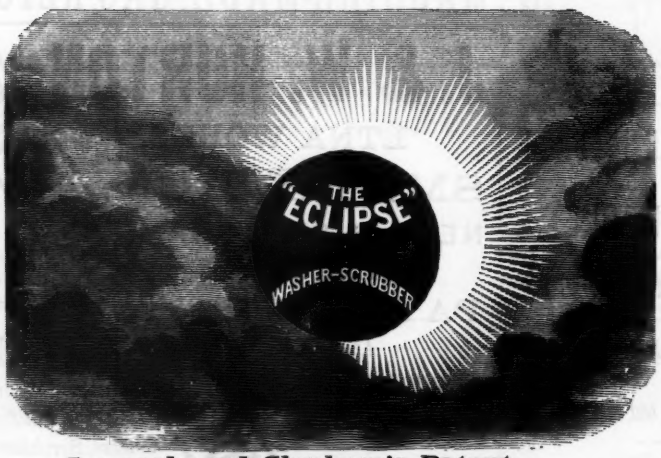
W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

CLAPHAM BROTHERS, KEIGHLEY. ESTABLISHED 1837.

Telegraphic Address: "CLAPHAM BROTHERS, Keighley."

WELLINGTON, NELSON, & MARKET ST. WORKS. Telephone No. 223.



Laycock and Clapham's Patent.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas.

55 "Eclipse" Washer-Scrubbers, varying in capacity from 50,000 to 4,000,000 cubic feet per day, passing a total of 54,450,000 cubic feet of Gas per day, have been erected.

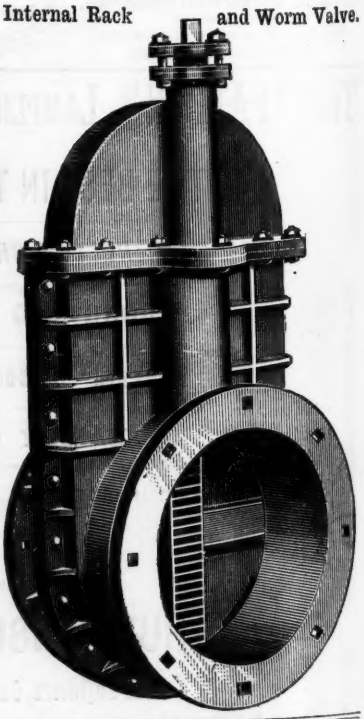
The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

Clapham's Improved Internal Rack and Worm Valve.



SILVER MEDAL, Inventions Exhibition, 1885.

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